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Steel for Valves of Combustion Motors*

Requirements Enumerated in the Light of Troubles, Which Experience Has Discovered in the Low Weight Engine

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THE author of this article fully realizes the difficulty and the complexity of the problem which he has undertaken. When in the technical branch of the English military aeronautical department, he was confronted many times with problems concerning the valves of internal combustion motors and this gave him the idea of studying the rules to which the valve construction must conform in order to give good service.

The problem was particularly studied from the metallurgical point of view, as he fully believes that valve defects are often due to defective material, more so than to faulty design or poor workmanship, although the two latter causes have been given due consideration whenever in his power to do so.

On the questions of workmanship and design the reader's indulgence is asked, as the author is more of a metallurgist than a mechanic; but as he fully realizes the fact that it would be absolutely illogical to neglect purposely the mechanical part, this latter will be considered whenever the occasion arises.

Working Conditions for Valves

The author proposes to fix, as far as possible, the various troubles to which valves are subject and to state to the best of his knowledge the various rational methods which can be used to overcome them. To do this, it will be necessary to study the conditions under which the valves work and to see how the latter are affected by them.

To start with, it is important to note that valves perform their work at a temperature sensibly above the normal. The temperature of the intake valves may vary from 100 to 600 deg. C, while that of the exhaust valves may vary, under the same conditions, from 250 to 860 deg. C. in aviation motors and those with a high speed; the last mentioned temperature is often obtained and it may be stated that the exhaust valves of high speed motors work between 700 and 860 deg. C., being well understood that sensible differences may exist in the working temperatures due to the cooling conditions which are far from being the same even in motors which could be considered as similar.

The various motors may be classified as follows:

1. Revolving motors.
2. Motors equipped with fins and radial cylinders.
3. Motors equipped with fins and with parallel cylinders.
4. Water-cooled motors.

Of all the above types, the revolving motors are the coolest and those of the fourth class the warmest; the second and third class represent the intermediate stages. As already stated above, motors of the same type may sometimes be found to work under quite different conditions, in fact they are far from being of the same design, power, dimensions, mean pressure, etc.

First of all it must be considered, on account of the high temperature to which a valve is subjected, the means by which it may be freed of its heat, as these means may allow the controlling of the temperature of the valves. The highest temperature is at the value head and it is here that the heat must be eliminated most rapidly. The three most important means to accomplish this are:

1. By letting the heat pass through the valve stem and go out by the guide.
2. By direct radiation of the surface of the head and collar.
3. By the conductivity of the valve seat.

Experiences have shown that this last means, dispersion of the heat by direct contact of the seat with the head, is the most efficient and therefore the one to be most carefully studied.

In order that the conductivity between the seat and the head of the valve be perfectly obtained, it is necessary that two main conditions shall be realized, that is:

1. The two surfaces shall come in perfect contact.
2. The valve shall be closed at time of explosion.

The first question will be fully discussed in connection with the second type of valves, but the second question is the most important. The most frequent causes of troubles due to the valves are really a consequence of premature ignition in the cylinders. If the valve does not perfectly bear on the seat at time of explosion this will originate an efflux of gas around the valve just at the time when the gas is at its highest temperature. Under these conditions the cooling of the valve head is very difficult and the valve will soon become unserviceable. The author has examined valves deteriorated by premature ignition, brought to at least 1150 deg. It may be safely stated that premature ignition is the cause for the greatest amount of valve trouble.

Although the amount of heat lost in the other

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two ways is of relatively little importance when compared with the first, nevertheless it is desirable to give them some attention so as not to be disappointed with the performance of the motor. It has been noticed in practice, for instance, that some exhaust pipes did not allow a free discharge of the hot gas, thus overheating the valve collar which would become even warmer than the head. Thus, instead of the valve head releasing some heat through the collar, it would receive an additional amount. In this case the valve would invariably burn out.

It is equally important that the heat be freely released also through the valve guides in contact with the stem. If the stem is of such a length as to protrude into the exhaust chamber, it will itself become heated and, therefore, it will not be of any help in radiating the heat. It must be remembered that a sufficient play exists between the guide and the stem.

Another factor which may cause trouble in the valve operation is the use of an imperfect carbureting mixture. The author will not make any suggestion on this point, as it is his opinion that this subject has been best treated by people better qualified than he, and, therefore, he will simply make a note of it as one of the frequent causes of trouble. Many of the valve troubles have been assigned to the poor quality of the steel while the real cause was a bad gas mixture.

It is to be noted that the wear between the valve guide and the stem varies according to the motor types, their working conditions being quite different. In the fixed motors the valve displacement follows the straight line, the only lateral stresses on the stem being due to the cam. This may be insignificant or important, according to the design of the motor, but the effects are rarely as serious as those produced by the inertia in the rotary motors. The travel for each point of the valve is never on a straight line, and the lateral stresses must be taken into account.

Various Valve Troubles

The various valve troubles may be classed as follows:

1. Elongation of the valve stem.
2. Distortion of the valve head.
3. Cracks in the valve head.
4. Excess play between the valve stem and its guide.
5. Excess play at the lower end of the stem.
6. Burning of the valve head.
7. Scaling of the valve head.
8. Breaking off of the valve collar due to self-hardening.

All of the above defects may be laid to the kind of steel or to the heat treatment and the author will study the questions in all details and will try to fix all the properties which the steel should have in order to avoid the above mentioned troubles, it being well understood, of course, that the motor be rationally designed and constructed.

1—Elongation of the Valve Stem

This defect does not occur often, but when it does it is the consequence of one of the three following things:

a. The use of a not sufficiently strong steel to work at a high temperature.
b. Overheating of the valve stem at parts in contact with hot gas.
c. Defective design of the valve collar.

The author has noted an elongation of almost 4 mm. (5/32 in.) after a few hours running of a motor, this elongation taking place especially at the collar which had not been designed with a sufficient section. Further on we will examine the qualities which must be found in the steel in order to avoid this inconvenience.

In regard to the overheating of part of the stem only, this is generally due to a defective design of the exhaust chamber or valve guide. Finally when the collar is quite weak, the section of the metal is not sufficient to cause adequate radiation of the heat.

It does happen sometimes that the elongation of the stem is the consequence of excessive accumulation of carbon deposits on the valve and this is the cause for other trouble, as will be seen further on.

2—Distortion of the Valve Head

In a certain motor great trouble was experienced on account of the distortion of the head of the valves and this was due to the fact that the rough valve forgings were not properly treated. The machining followed immediately after the forging and valves were placed into the motor without getting rid of any of the internal stresses caused by the forging operation. When the motor started to work, these stresses disappeared and the valves bent appreciably so as not to bear properly on their seats. Once this stage was reached, the destruction of the valve was but a question of a few hours.

It is important that the forging work performed on valves, and in a general way all forging operations, be made with a full understanding of the work the piece is called to perform and all possible care taken in order to eliminate stresses brought about by the forging. This may be attained by ordinary methods if a proper steel is used, otherwise the drawing will answer the purpose, if made at a sufficiently high temperature.

The distortion of the valve may also be produced if the forging has been carefully taken care of but the valve has been unevenly cooled. This can be remedied, at least in part, by designing the valve so that it can turn on itself when the motor is running.

Another cause of the distortion of the valve is the unexpected softening of the steel while the valve is working. The effect of the spring and the impacts against the seat are sufficient to produce important deformations. The author has examined cases in which the distortion had become very important due to the use of steel either too soft or not strong enough for the temperatures to which it had been submitted; the valve had acquired an "umbrella" shape.

Besides the above causes, the warping may be produced either by a poorly designed valve or a valve head lacking the necessary amount of metal.

3—Cracks in the Valve Head

This defect is principally due to the steel. The cracks may have been in the bars before the steel was forged or result from the forging operation. Often they are very insignificant and great care is required in order to discover them.

Sometimes the cracks are made during the running of the motor. If, for instance, a self-hardening steel is used, it is possible that the temperature the piece will acquire while motor is running becomes higher than the tempering temperature and when cooling the cracks will appear.

To whatever cause the fissures may be due, they are always dangerous and even the smallest will allow the destructive action of the gas to act on the steel and quite often may be seen, as a consequence of this defect, a full size groove in the valve

head; several close-by cracks may join and cause the breaking away of a piece of the metal.

4—Play Between Valve Stem and Guide

This inconvenience is most noticeable in the rotary motors, but it is possible to avoid it by the use of proper steels. As a general rule the valve stem is never brought to a temperature above 400 deg. and it is not hard to choose a steel which would give good results at this temperature.

5—Play at End of Valve Stem

This trouble is a common occurrence in cases where the cam acts directly on the valve without the use of any intermediate part which may absorb the impact. If the valve mechanism is such that the valve acts directly, the lower end of the valve stem shall be hardened, but this part only. This requires, naturally, the use of a suitable type of steel, but it must be noted that no valve shall be used in a motor the head of which has not been carefully drawn; therefore if a valve arrangement is wanted with a direct acting cam, it is necessary that the lower end of the valve stem shall have, at least for a short length, a greater resistance to wear than the one existing at the valve head.

These conditions are not always easily realized and therefore it is not rare to have the lower end of the valve stem softer than it should be or hardened so that it will easily crack. In order to remedy this trouble it is necessary to use a steel easy to heat-treat or to make arrangements in order to equip the lower part of the valve stem with a piece made from another metal.

6—Burning of Valve Heads

Although the above is a frequently used expression, nevertheless, it is one whose meaning is not well defined. The burning may be due to different causes and not all of them may be traced to the steel and it may be more exact to state that if there is any burning, this has been brought about by the bad conditions under which the motor has worked, as for instance, pre-ignition and poor valve arrangement.

The cracks in the valve face are a common source of burning as already seen. In the same way if a valve does not rest properly on its seat, the burning of the valve must be expected. In this case there is such a strong flow of hot gas around the valve that the temperature becomes much higher than it should be and, besides, the valve not having a proper bearing on its seat cannot conveniently cool.

7—Scaling of Valve Head

As has been seen, the oxidizing or scaling of the valve is also a cause of trouble. The scaling may take place at various places, but it is seen most on the lower surface of the head or at the collar, or on the lower part of the valve stem. The scaling depends either upon the temperature to which the steel is brought or upon the characteristics of the steel itself.

Some steels oxidize easier than others and it may be stated as a general rule that the higher the temperature, the easier the steel becomes oxidized. If a valve scales at any point, it is highly probable that this point becomes separated on account of the blows and vibrations and if it falls on a part already over-heated, it may facilitate the oxidizing process at exactly that point. If the scaling takes place close to the valve head or if a part of the scale or other foreign matter falls near the seat, the valve will not seat properly and the exhaust gas will pass around this place producing caving-in of the metal. As another consequence of this defective valve seating, the cooling of the valve cannot be successfully accomplished and the temperature of the valve head increases considerably. In all cases the quantity of oxidized material will increase rapidly until the head is completely corroded in the neighborhood of the dangerous point.

A classification of steels with reference to the list given in the article on the requirements to be met in service has been attempted by the author and forms a feature of the second instalment of the article. Tungsten, chrome and nickel steels are covered. The curves include one showing the resistance to scaling of several kinds of steel.

8—Breaking Due to Self-Hardening

Numerous cases have been examined where the valve has performed its work in a satisfactory way for a certain length of time and then it will suddenly break off at the head or collar. This is brought about especially when starting a motor which has been run and then had time to cool off.

Valves breaking in this way are generally made of nickel-chromium steel hardened in air. During a previous running of the motor, they have reached a minimum temperature of 750 deg. C., then cooled off. The consequence of this cooling off has been the acquiring of a hardness so that the maximum tensile strength of the steel has possibly reached a value of more than 150 kilos per sq. mm. (213,300 lb. per sq. in.). Naturally, this hardness brings with it a considerable increase in brittleness and fissures may also appear due to slight surface irregularities. When the motor is started again, this valve will suddenly break off.

It is important, therefore, to choose a steel which will not harden when cooling in the air after having been brought to the temperatures which the parts acquire when running the motor.

Properties of Ideal Valve Steel

The foregoing paragraphs have shown in various ways how valves may deteriorate and as a consequence have pointed to some of the properties the steel must have in order to be used in the manufacture of valves for internal combustion motors. Therefore the ideal steel to be used in this case must possess a large number of qualifications and these are quite hard to find in any one class of metal. Below are mentioned the most important:

1. The greatest possible strength at high temperatures.
2. The least brittleness.
3. Forgeability.
4. The possibility of being machined without cracks either showing up during the machining of the steel bar or during the forging operation.
5. The possibility of being heat-treated in the regular way.
6. Least tendency to oxidation and scaling; if the latter takes place, it should be as adherent as possible.
7. The property of retaining its original physical properties after having been frequently heated at a high temperature and then cooled to normal temperature, or, to have been kept at a high temperature for a considerable length of time.
8. No tendency to become hardened by cooling in the air when starting at the usual normal temperature at which motor valves are known to work.
9. Possibility of being treated after the forging operation without originating abnormal internal stresses which may cause warping.
10. Sufficient strength so as not to be affected by the play existing between the guide and the stem.
11. Possibility of heat-treating the lower end of the stem, if necessary.
12. Possibility of being easily and satisfactorily machined by ordinary means.

From the list it can be easily seen that no kind of steel presents at the maximum all the desirable qualities. Nevertheless, steels which have been used in the past have been chosen either because they offered all these qualities in a certain amount or some of them only but in a higher degree.

(To be continued)

Engineer's Responsibility to Workman

In New York Celebration of Fortieth Anniversary of American Society of Mechanical Engineers a Meeting Is Held on the Industrial Problem

A NOTABLE list of speakers and congratulatory telegrams from public men, including President-elect Warren G. Harding, Vice-President-elect Calvin C. Coolidge and Herbert Hoover, among other things president of the American Institute of Mining and Metallurgical Engineers, marked the celebration of the fortieth anniversary of the founding of the American Society of Mechanical Engineers held the night of Nov. 5 in the Engineering Societies Building, New York. This was one of 32 similar meetings held simultaneously in various parts of the country. The topic of the meeting was "The Opportunity and Responsibility of the Engineer," and this was discussed by the principal speakers; J. Herbert Case, acting governor Federal Reserve Bank of New York; Samuel Gompers, president American Federation of Labor, and William B. Dickson, vice-president Midvale Steel & Ordnance Co. Fred J. Miller, president of the society, presided. Besides the main speakers named, Henry R. Towne, oldest living past president of the society, dwelt on the early activities of the society. Messages of good will from other engineering societies were delivered by A. P. Davis, president American Society Civil Engineers; W. L. Saunders, past president American Institute of Mining and Metallurgical Engineers, and Charles F. Scott, past president American Institute of Electrical Engineers. Among the telegrams was a fitting "hands-across-the-sea" message from the Institution of Mechanical Engineers, of London, which was read by W. H. Patchell, a member of the council of that society.

Much was said by all the speakers of the evening about the need of humanizing industry and making it democratic, and the discussion was enlivened by outspoken criticisms of present-day industrial autocracy and the trend toward feudalism in certain industries.

Mr. Case asserted that in the recent remarkable fall in commodity prices the Federal Reserve Bank had met its most severe test, and had saved the country from a disastrous financial upheaval. He predicted that with the Federal Reserve Bank organized as it is now there will be no more banking panics in this country. He even went so far as to say that with greater refinement in currency and banking procedure commercial crises such as encountered by the cotton and other interests in recent months will be avoided.

Mr. Gompers made a plea for a greater differentiation between human and material affairs in engineering procedure. "The tendency during the last 75 or 100 years of our western civilization," said he, "has been to have the machine replace the man. The old feeling of craftsmanship which existed before the industrial revolution came about has been greatly modified because of the perfection reached in machine design. This process, however, has been carried entirely too far, for in many places the man has become a human connecting link in a machine and mastered by it instead of controlling the machine himself, as he did with the tools that he used in the old days. The result is that to-day men's work tends to become mere toil, so it seems to me that the task that lies before us is to develop a definite kind of working environment which will be attractive and which will inspire rather than repulse the workman. The work itself must become of central concern. This cannot be brought about unless the man finds the opportunity for self-expression in the day's work and a chance to exercise his creative impulses.

"During the past 50 years the labor movement has endeavored to protect the workman against the inroads of the machine upon his own life. Our fundamental effort toward this end we epitomized in this declaration: The labor of a human being is not a commodity or article of commerce."

Mr. Gompers went on to declare that "it is the deadly monotony of repetitive work that is at the root of most of our troubles, and I, therefore, in the name of the workers, urge upon you engineers to direct your energies to the solution of this problem. Beware that the machines you create do not become a Frankenstein and enslave the human race. If you study the laws of humanity with the same degree of intensity that you study the laws of material science," he concluded, "you will render a tremendous service, and as president of the American Federation of Labor it is my firm conviction that the labor movement not only welcomes but invites your co-operation."

Address by Mr. Dickson

What Mr. Dickson had to say, substantially in full, is as follows:

Most men will agree that our present social order is showing signs of instability. This is particularly true abroad, but we in America are not lacking in signs which point to a disturbed state of mind, especially on the part of workingmen. The authority of old standards and conventions is being questioned, sometimes in such a manner as to take one's breath away. For instance, in the proposed Plumb bill for handling the railroads.

Human Problem in Repetitive Work

The question has been raised by thoughtful men whether or not the applied sciences, progress in which is peculiarly the boast of our age, have really advanced the human race in the path of evolution. I believe that they have, but, nevertheless, there are grave dangers attendant on modern conditions of work and living which must be recognized and counteracted, if American ideals are to be preserved as energizing factors in our civilization.

About a year ago, in speaking to the Philadelphia branch of your society, I dwelt on what I consider the menace of the highly specialized task in our modern factories. I am going to mention it again because I have been seeking light on it ever since but without success. If I am wrong in my premises, I wish you would show me; and if I am right, I would like to know the answer to the problem.

The danger to which I refer is the high degree of specialization in modern industry. The division of labor, which is such a marked characteristic of modern industry, has added a new complexity to the relation of employer and employee and has brought with it new problems which vitally affect the community life.

My point was that the old conditions furnished what I feel to be an essential factor in a normal life, *i.e.* joy in work through the exercise of the creative instinct. It is difficult for me to associate this feeling with the highly specialized task where the workman performs a simple operation over and over, perhaps for years.

I feel that the opportunity for the expression of the creative instinct in our modern factory is very limited. I am also convinced that the natural, inevitable effect on the individual of the deadly monotony of highly specialized factory work is to stunt him mentally, morally and physically *unless it is counteracted by some other vital force.*

It is unthinkable that there should be any backward step in our industrial progress. No sane man would propose to solve this problem by reverting to the old conditions. Our shoes, clothing and all other products essential to our present civilization will have to be made more and more by highly specialized automatic machinery.

But if I am justified in my premises, there is a

human problem which must be faced; and in my opinion it is a problem in the solving of which lies the question of the survival of our democratic ideals.

It has been said that free government is more important than good government. I believe this to be a profound truth, and applying it to the form of government and admitting the manifest advantages of a concentrated governing class in securing a highly efficient social order, I would say that if there must be a choice, it is better to be free and inefficient than to secure efficiency by having men become mere cogs in a complex social machine operated by a so-called superior class.

Democracy in Industrial Relations

The principal theme, however, to which I wish to direct your attention is a broader one, and in the working out of the social problem which I will present I am hopeful that an answer will be found also for the problem of the specialized task.

My theme is this: What is the supreme issue confronting mankind to-day? In my opinion, simply the same issue which runs back through all history, and which we have fondly dreamed was settled once and forever by the American people, namely—aristocracy versus democracy.

We Americans are so accustomed to think of democracy as the normal system of human government, the very flower of civilization, that the man in our midst who would seriously question this apparently self-evident truth would be looked upon as abnormal, to say the least.

We achieved, or we fondly hoped we had achieved, political democracy when Cornwallis surrendered at Yorktown. As a matter of fact, democracy is not an achievement; it is an opportunity for further struggle upward.

We must now set our minds to the task of applying democratic principles to industrial relations.

I believe there is a grave menace to our American ideals in the highly centralized, autocratic control which is becoming a marked tendency in our great industries.

The feudal system was based on the ownership of land and its appurtenances—such as highways, mines, streams, fisheries, etc., by the barons, and it was effective in securing autocratic control of the workers, because the vast majority were tillers of the soil or workers in other industries controlled through land ownership.

The tendency of our modern industrial system is toward autocratic control of the workers through ownership of what our socialistic friends term "the tools of production," which include not only the natural resources but also the furnaces, mills, factories and transportation systems.

Two Happenings Under Existing Corporate Control

Instead of indulging in glittering generalities, let me cite two instances of what has happened under the existing systems of corporate control:

Some years ago a gentleman at the head of one of our great corporations decided that prices must be maintained in the face of a diminishing demand. In order to accomplish his purpose, he restricted production by shutting down a number of large plants located in different communities, each of which had been built up largely as an adjunct of the plant.

Some of these plants were kept closed for about a year, and the result was disaster to the communities. The merchants were driven out of business, real estate values were depreciated, and the workers were thrown on their own resources and had to break up their homes and seek employment elsewhere. None of these persons had any voice in the momentous decision which was made in a New York office and which resulted in social paralysis in all of these communities.

This last summer the president of one of our largest textile companies suddenly announced that his mills would close for an indefinite period, and they were closed in the same arbitrary, autocratic manner as above described.

History is filled with instances where centralized power has led to conditions inimical to human progress, as that term is usually understood in America. It is the effect of the unconscious insolence of conscious power.

Consider for a moment the despotic power which our modern system of industry gives a few men over the lives and fortunes of hundreds of thousands of their fellow-citizens. By reason of this condition we have the unstable situation of a government founded on the suffrages of men who, for all practical purposes, are industrially bondmen.

If we should read in the paper some morning that a Turkish pasha had exercised his authority in such a way as to deprive a city of its means of subsistence, we would raise our eyes in holy horror and bless our good fortune in living in a more enlightened land.

Any manifestation of autocracy is repugnant to the American people, whether it proceeds from a president of a corporation, a president of a labor union, or a president of the United States.

What is the answer? Only one, namely—industrial democracy.

In a great national crisis Lincoln said, "A house divided against itself cannot stand . . . this nation cannot continue to exist half slave and half free."

An Industrial Lincoln Needed

I believe that we are approaching a time when we will need an industrial Lincoln, who will give utterance to the creed of the twentieth century: "A house divided against itself cannot stand; this nation cannot continue to exist politically democratic but economically autocratic."

What do I mean by industrial democracy? It is exceedingly important that there be no confusion as to this definition. Mr. Carnegie was once asked, "Which is the most important factor in your business—capital, management, or labor?" He replied, "Which is the most important leg on a three-legged stool?" This answer epitomizes my theme and also what I believe will be the creed of the twentieth century.

In an efficient partnership, such as Mr. Carnegie's answer implied, while each partner may have equal rights, the duties and responsibilities are usually separated so that each exercises his principal functions within his own limited sphere. But where grave questions are to be considered, which vitally affect the organization as a whole, there is general consultation.

So, in the new ideal of industrialism, each factor, *i.e.* capital, management and labor, will continue to have its own separate natural function, as heretofore, but no arbitrary, autocratic decisions affecting the general welfare will be made, either by the directors, the officials or by the workmen.

Some of you may ask, "Did Mr. Carnegie follow this ideal in practice?" My answer is "No." He did give a larger measure of recognition to management than most of his fellow-manufacturers, but in his attitude toward labor he was merely a sign-post, pointing the right way but never taking it.

The Carnegie labor policy was highly autocratic, as is that of its successor, the United States Steel Corporation; a benevolent autocracy, if you please, in many splendid ways, although it still maintains that relic of barbarism—the 12-hr. day. But however large you write the word "benevolent," you must always write after it the word "autocracy."

The Steel Corporation has become such an important factor in our national life that it is a fair object for criticism. The Corporation deservedly stands high in the estimation of the American people because of the material advantages enjoyed by its employees, but its managers have, as yet, failed to appreciate the spirit of the times. To paraphrase St. Paul: "Though they pay the highest wages, give pensions, and furnish every modern convenience and safeguard to their workmen, and have not democracy, it profiteth them nothing."

The autocratic policy of this great industrial corporation is diametrically opposed to American ideals, and if it and similar organizations in other industries continue to grow and to maintain this autocratic attitude, there can only be one result—industrial feudalism; feudalism with a high degree of comfort and

safety for the worker, I grant you, but none the less, feudalism.

[At this point Mr. Dickson, who had apparently not expected that the head of the American Federation of Labor would be on the platform with him, turned momentarily toward Mr. Gompers and then continued.]

I am anxious to observe every courtesy to my fellow speaker of the evening and yet, lest my position should be misunderstood, I desire to make it clear that in the recent steel strike the course taken by the Steel Corporation had my hearty approval.

When a man, or a number of men, for their own ends, create a great industrial unit, they assume an obligation toward the human elements in that unit, and through them, to society in general, which cannot be canceled or suspended arbitrarily. I subscribe to the doctrine that human labor is not a commodity in the ordinary sense of that term.

At the Base of All Social Unrest

In a completely natural society, every man by reason of close and continuous contact with land and other natural resources would be an independent, self-sustaining unit. When a man has left this natural condition, whether voluntarily or otherwise, and has become the servant of another man, or other men, he has given up a natural right and his employer has assumed an equivalent obligation. The fact that neither the employer nor the employee has been conscious of this exchange, and that both may have acted from purely selfish motives, does not alter the elemental fact which, in the great national aggregate, constitutes the great unanswered problem of modern times—the elemental fact that is at the base of all social unrest.

In the two instances which I cited, where communities were paralyzed by the arbitrary closing of plants, the American way to handle such a situation would be to have a conference of the representatives of the three factors, *i.e.* capital, management, and labor, which, after considering all of the facts, would determine whether to shut-down, operate part time, reduce wages and salaries, or adopt any other course which would give the fullest recognition to the *human* factors involved.

I believe that the greatest task to which American employers must address themselves is the devising of practical ways in which labor can be given the full recognition to which, as an equal partner, it is entitled. I make this statement with absolute confidence in the fairmindedness of the American workingman when he is fully informed and is entirely free to act. If I did not have this confidence I would despair of the future of our free institutions.

In an address delivered by me in 1915 I said:

"The individual workman, dependent on his own strength and resources, cannot hope to bargain on equal terms with the corporation. If he cannot do so, he is no longer a free man, but a serf; and the serf has no place in the future of America."

I believe, therefore, that one of the first steps necessary to inspire the workmen with confidence is the sincerity of the employers' recognition of the proper status of labor, in the adoption of a fair system of collective bargaining.

I also believe that in the near future the workmen must become partners through some system of profit-sharing. No scheme could be adopted which would be applicable to all business, as each particular company would have to adapt the general idea to its own peculiar conditions.

I will not enlarge on this idea, which is too important to dismiss lightly, except to say that in any such partnership, while the economic needs of the human factors must always be recognized in preference to property rights, the workmen must have a real stake in the enterprise, probably through the investment of his savings in the stock.

Choice Between Democracy and Serfdom

But, some of you may say, "We don't want to have anything to do with your so-called industrial democracy; we are satisfied with the present system and prefer to continue as we are."

My answer to this is that human relations are not static, but dynamic, and unless I am entirely mistaken as to the direction and force of the tide which is now running so strongly in human affairs, your choice will not lie between the present system of industrial control and industrial democracy.

American industry has come to the parting of the ways; on the right is the road that leads direct to industrial democracy. This road has some heavy grades, and a higher degree of skill will be required to drive on it, but it will bring us out into Peace Valley.

On the left is a road also deviating from the old road by which we have come, but it is cunningly camouflaged so as to seem to be the natural continuation of the main highway. It leads directly to industrial feudalism; to that social condition predicted by Hilaire Belloc in his book, "The Servile State," in which the workers voluntarily sacrifice freedom in return for comfortable maintenance and safety.

From this second road there is also a by-path which is now being trodden by Russia, and toward which not only our British brethren but a considerable number of American workmen are being tempted to stray.

In other words, the choice lies between democracy on one hand and serfdom or chaos on the other.

Let me again quote Andrew Carnegie, who said in his "Problems of To-day": "Revolutionary socialism is successfully to be combated only by promptly conceding the just claims of moderate men."

To Counteract Present Tendencies

To sum up, what can be done to counteract the tendencies which I have described? These things seem to me to be entirely practicable:

1. Place our industries on a more democratic basis, giving recognition to management and labor, as equal partners with capital.

2. Teach democracy in our schools and colleges as thoroughly as we teach arithmetic, so that it will permeate every phase of human life, politically and industrially.

It is a constant source of wonder to me to find so many persons in all walks of life who have no real conception of the vital principles of democracy.

Life, in its truest and most virile sense consists largely in making choices, and, like the traveler before the Sphinx, we must answer correctly or be destroyed.

I am not looking forward to the new era of industrial democracy as a period of peace and serenity, but rather as a time in which the way has been cleared for a further toilsome climb up the spiral of evolution.

I am hopeful that our generation will guess the sphinx riddle, and that "Out of this nettle, danger, will pluck the flower, safety."

Boston Mechanical Engineers Celebration

The Boston section of the American Society Mechanical Engineers commemorated the birthday of the society Nov. 5 at the City Club, a few more than 250 members and guests attending. Charles T. Main, past president of the society, presided at the dinner, and in his opening address gave some interesting facts concerning the history and purpose of the organization. He admitted feeling reasonably certain that Governor Calvin Coolidge, as vice-president of the United States, will be more receptive to offers of engineering association service than vice-presidents of the past.

Following his opening address Mr. Main introduced two intensifying phonograph records, the invention of William H. Bristol, Waterbury, Conn., a member of the society, which transposed words of welcome from the president, Fred J. Miller, and a past president, Dr. Ira N. Hollis, Worcester Polytechnic Institute. These records were demonstrated here and at other birthday celebrations for the first time in public.

Francis W. Dean talked on the early days of the society, giving many amusing sidelights on the characteristics of some of the members in the '80s, including Corliss and Porter of engine fame; Henry R. Worthington, a pioneer in the water pump field; A. L. Holley, who, he said, introduced the Bessemer method

of steel production into this country; G. E. Strong, who invented the first machine in this country for making corrugated furnaces, and also the first feed-water heaters; and John Fritz, who introduced the first three-high rolling mill into this country and built the Bethlehem Steel plant. Lantern slides showed the early quarters of the society in New York and the various presidents of the organization.

A. E. Baird, Caines Institute, followed with a blackboard talk on sciences in vogue B. C. 200 to 1000, and how they applied to present-day methods. He was followed by La Rue Vredenburgh, Edison Electric Illuminating Co., of Boston, who brought out the value of treating business customers with consideration and kindness. John R. Freeman told about recent engineering developments in China and the Far East.

National Founders' Meeting

The annual meeting of the National Founders' Association, to be held at the Hotel Astor, New York, Nov. 17 and 18, will be featured by the following addresses at the Wednesday afternoon and Thursday sessions:

"The Relationship of the Stock Exchange to Industry," by J. Edward Meeker, New York Stock Exchange.
"Industrial Relations in Arsenals of Ordnance Department, United States Army," by Col. T. C. Dickson, commanding officer, Watertown Arsenal, Watertown, Mass.
"Union Labor and Transportation in New York," by Walter Gordon Merritt, associate counsel, League for Industrial Rights.
"Americanization on the Screen," by C. C. Pettijohn, New York.
"The Open Shop Movement in the Southwest," by W. S. Mosher, manager, Mosher Mfg. Co., Dallas, Tex.
"Modern Foundry Equipment," by Joseph J. Wilson, plants manager, Saginaw Products Co., central foundry plant, division of General Motors Corporation, Saginaw, Mich.

Motion pictures having a bearing on foundry problems will conclude the Wednesday afternoon session. The Wednesday morning session will be given up as usual to the reports of President William H. Barr, Commissioner A. E. McClintock and Secretary J. M. Taylor. James A. Emery, counsel National Industrial Council, Washington, is scheduled for an address on "The Progress of the Open Shop." As has been usual for some years, a buffet luncheon will be served to members and guests in the intermission between the two sessions of the day. On Wednesday evening will occur the convention dinner.

The executive meeting of the administrative council will be held at 10 a. m. on Tuesday, Nov. 16, and the usual alumni dinner for past and present members of the administrative council will occur on Tuesday evening.

Material Handlers of A. S. M. E. Elect Officers

By letter ballot, sent out by the organizing committee of the Materials Handling Section, American Society of Mechanical Engineers, the following members have been elected to the executive committee of the section: Chairman, Robert M. Gates, engineer at Philadelphia of the Lakewood Engineering Co.; Harold V. Coe, who specializes in industrial engineering, plant development and rehabilitation; F. A. Wardenberg, directing engineer, Du Pont Powder Co.; Nathan C. Johnson, consulting concrete engineer, formerly engineer with the Raymond Concrete Pile Co.; and Kern Dodge, consulting engineer on industrial power plants, formerly associated with Charles Day and at one time with the Link-Belt Co.

Will Soon Blow in Furnace

The St. Louis Coke & Chemical Co., Granite City, Ill., has practically completed 40 of 80 coke ovens under construction and a 600-ton blast furnace, and is now heating them preparatory to putting them into operation. The coke plant will produce metallurgical coke from 100 per cent Illinois coal. Part of the coke will be used in the blast furnace. The major part of the pig iron produced will be shipped as hot metal to the plant of the National Enameling & Stamping Co. in the vicinity, and the remainder will be sold on the open market.

Landis Machine Co. Opens New Shop

The Landis Machine Co., Waynesboro, Pa., was host to about 1400 employees and their families, Oct. 30, at the opening of a new shop, 146 x 308 ft., completely fireproof. No machines had been installed and the interior was hung with Hallowe'en decorations and arrangements made for dancing and an entertainment. The roof of the new shop is from 4 to 6 in. thick and composed of Keystone gypsum. Windows throughout the building are of ribbed glass and set in steel sash. The interior of the building is painted white, with pipes, radiators and electric conduits in blue, maroon and black, the standard colors adopted for use throughout the plant. A septic plant for sanitary drainage has been installed.

J. G. Benedict, treasurer, outlined the history of the company from its incorporation in 1903 to take over the plant of the Smith Mfg. Co., which consisted of one building, 80 x 100 ft., to the completion of the latest addition. Mr. Benedict also described briefly the line of tools which the company manufactures and the additions to the line which were made from year to year. He spoke particularly of A. B. Landis as the man who conceived the long life die, which he worked on for many years and which was finally brought to a successful completion by Mr. Fisher of the company, who had worked with Mr. Landis on the experiments.

Abundant Coal Supply for Detroit

DETROIT, Nov. 8.—Coal wholesalers report that Detroit and Michigan industries and public utilities have loaded up with power coal to the extent of storage space and that there will be no such great demand for coal, with temporary shut-downs and curtailments of production, as has been the case the last four winters.

In Detroit, industrial and utility supplies are estimated at from three to 10 months surplus over immediate needs. The normal requirements of Detroit for industrial and domestic consumption run about 1000 cars a day, but until a few months ago no such quantity of coal had come into the city for more than two years. Consequently, it is not to be wondered at that the plants this year set out to get all the coal they could at whatever price it was necessary to pay.

One day recently the Ford Motor Co. had 1700 cars of coal on tracks, and other concerns, like the Packard Motor Car Co. and the Dodge Brothers Co. had 500 to 750 cars. It is reported that the Ford company paid anywhere from $7 to $15 a ton for coal that formerly cost $2 or less. The Detroit industries did not work together, and consequently bid against each other in the market, while the operators reaped the benefit of this lack of co-operation. On the other hand, the utilities commissioned wholesalers to buy power coal at the mines and set a maximum price, with the result that they obtained their coal as low as $4.75 a ton, and the supply came so fast that they were forced to call a halt on deliveries.

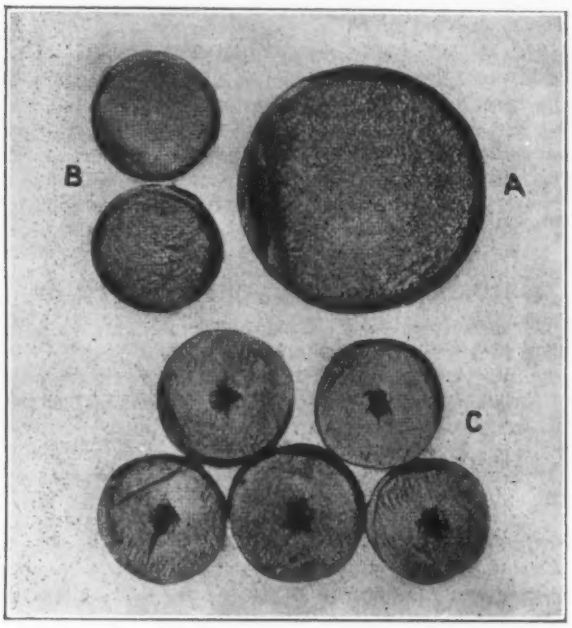
Fine Record for Production

What is believed to be a record iron production during a continuous run has been established by "A" blast furnace in the East Youngstown group of the Youngstown Sheet & Tube Co., Youngstown, Ohio, which turned out 1,110,637 tons of pig iron from March 14, 1915, to Nov. 6, 1920. The stack is still operating. During the period mentioned, it was banked three times, for a few days at a time, owing to fuel shortage or labor disturbance, but the fires were never allowed to go out. This furnace was originally put in commission Nov. 3, 1908, and operated continuously until April 21, 1911. Operation was resumed June 8, 1911, and continued until Nov. 14, 1914, after which the record run was started the following spring. Its aggregate iron production has been 2,129,188 tons.

The Waynesboro, Pa., foundry of the Emerson-Brantingham Co. has been closed indefinitely. Molders formerly employed in the plant are leaving Waynesboro for employment in other sections.

Splitting Steel in Forging

How it is possible for a splitting to occur in the center of generally sound steel bars was discussed briefly in a comprehensive paper on billets for drop forging operations presented by Harry Brearly of Brown Bayley's Steel Works, Ltd., Sheffield, England, before a joint meeting of the West of Scotland Iron and Steel Institute and the Association of Drop Forgers and Stampers held at the Royal Technical College, Glasgow, March 24. The author touched on imperfections as they arise from defects originally in the ingots, from mistakes in the reheating of the ingot and from bad rolling or forging. Much of his argument was that both producer and user have something to learn and that it may not be clear why some defects occur, and therefore honest efforts should be made to ascertain the truth. "If the steel maker were clever enough,"



SPLIT CENTERS IN ROUND BARS AFTER FORGING

(a) represents the original bar
(b) fracture after the bar has been properly reduced and sectioned
(c) after attempting to reduce throughout in the form of a round

he said, "to place defects in stampings, he would place them where they are harmless. Ninety-nine times out of a hundred, leaving pipe and segregates out of account, the fault is with the stamper, and when the hundredth case occurs it is a question of having chosen the wrong class of material for the job."

A hole in a stamping, he went on to say, may be due to piped billets or not, depending on where it occurs. This is obviously a special case of a defect which may be located every time in the same part of a stamping, because it occurs in the same part of each billet. A sulphur print is very good evidence in such cases. If the cavity is lined with segregates, it is probably pipe. If it is not lined with segregates, it may still possibly be pipe, but the overwhelming chances are that the center has split in forging.

The tail of a crankshaft, for example, which is drawn down and rounded under flat-faced tools can be easily split in the center, as may be demonstrated by making a few experiments with bars which have been proved sound beforehand. The same thing can be demonstrated with plasticene. The accompanying illustration shows examples of split centers produced from sound bars. The tendency to split in the center under unfavorable forging conditions is not equally great in all billets made from the same ingot. If the ingot is sound, and free from pipe, the best billets are those made from the bottom third and the top fourth of the ingot.

Karl Hoffman and M. Rosenballt, doing business under the firm name of the New Britain Iron Works, New Britain, Conn., have dissolved partnership. Mr. Hoffman is now sole owner of the business.

To Organize Welding Industry

An important decision involving the legality of patents on the process of spot welding was handed down recently by Judge J. M. Killets in the Federal Court in Detroit. Action was brought by the Thompson Spot Welder Co. against the Ford Motor Co., the plaintiff charging an infringement of the so-called Harmatta patent granted in 1912. The court held the Harmatta patent to be invalid and the bill of complaint of the Thompson company was dismissed. The decision in favor of the defendant was based on a finding that F. F. McBerty, Warren, Ohio, anticipated Harmatta by a year or more in inventing and reducing to successful practice the process of electric spot welding and the upholding of some of the other claims set up in the answer of the defense. In a previous decision handed down in Boston in 1916, the Harmatta patent was held valid. It is expected the late decision will be appealed.

The defense in this case was conducted by the Welding Patents Investigating Committee which is composed of a large number of users of electric spot welding machines and of which H. C. Milligan, president Republic Stamping & Enameling Co., Canton, Ohio, is chairman. This committee will hold a meeting at the Hollenden Hotel, Cleveland, Nov. 9, to form a permanent organization to which all interested in the welding industry are invited. It is stated that the calling of this meeting has no connection with the Thompson case in Detroit. The object of the proposed organization will be to improve the methods in electric welding and to assist in patent work. Affiliated in the Welding Patents Investigating Committee, which has been in existence nearly two years, are nearly 500 men using 2000 electric welding machines and it is expected that all these will become members of the new organization, the scope of which will be along broader lines than the work of the committee.

New Local Chapter of American Society for Steel Treating at Syracuse

A new local chapter of the American Society for Steel Treating was organized at Syracuse, N. Y., on Oct. 19, to be known as the Syracuse Chapter. The first meeting had an attendance of 175 and there were 76 applications for membership the first night. The chairman of the new chapter is Howard J. Stagg, Jr., assistant manager Halcomb Steel Co., with Frederick C. Raab, metallurgical engineer Brown-Lipe-Chapin Co., and William F. McNally, Willys Corporation, New Process Gear Division, as vice-chairman and secretary-treasurer respectively. The executive committee comprises L. M. Fenner, chief chemist and metallurgist H. H. Franklin Mfg. Co.; R. C. Gebert, chief metallurgist Hammond Steel Co., Inc.; P. A. Hopkins, engineer Penn Spring Works; E. D. Newkirk, treasurer Onondaga Steel Co., and O. L. Van Valkenburg, chief chemist Crucible Steel Co. of America, Sanderson Works.

Half Century of Service Rewarded

A 12-page booklet, deckle-edged and of novelty paper, entitled "In Commemoration of Two Score Years and Ten of Service," has been published by the Watson-Stillman Co., Aldene, N. J., maker of hydraulic machinery, in honor of Walter Watson, a machinist, who has been in the continuous service of the company since Nov. 1, 1870. The directors recently voted Mr. Watson a check for $1,000; $65 per month for life upon his voluntary retirement; and $50 per month for his wife after Mr. Watson's death. In the language of the directors' resolution: "His record as a machinist has shown him to be highly skilled, industrious, faithful and loyal to the company and its development; his splendid personal character, modesty and integrity have won the admiration of the officers and associates of the company." Eight other men, who had been in service 25 years, were presented either watch fobs or gold watches. In the booklet is a brief history of the company from the time it was founded in 1848 by Eliphalet Lyon as a small factory for making hydraulic jacks, lever punches and shears, together with general jobbing machine work, at 17 Goerck Street, New York.

Business Problems Facing Washington

Resumption of Peaceful Relations, Revision of Tax Laws and the Tariff Are Some of the Subjects to Receive Early Attention of the Harding Administration

BY OSWALD F. SCHUETTE

WASHINGTON, Nov. 9.—Although President-elect Harding will not take his oath of office until March 4, 1921, the election of a Republican majority in both the House and Senate makes it possible to forecast the general lines of the executive and legislative policies most vitally affecting the industries of the United States.

Foremost will be the restoration of peace with the world. There is a possibility that the winter session of Congress will again attempt to force President Wilson to proclaim the termination of the war. If it fails, it is expected that the Harding administration will make short work of our "war" and pave the way for the speedy resumption of peaceful relations, not only with Germany but with all the world. It is possible by that time that the Russian situation will also have clarified itself so far that a general resumption of trade relations with Europe and Asia can be effected.

Revision of Tax Laws

Second in line of importance to the nation, and almost first in its importance to industry, will be the complete revision of the Federal tax laws, both as to internal revenue and as to customs duties. This task will not be undertaken until the special session of the 67th Congress is convened, probably sometime in April, 1921. Although the question of a protective tariff played a small part in the campaign, the Republican leaders pledged themselves to this doctrine and a tariff revision upward is practically insured. A number of special tariff bills are pending in the present Congress, but there seems little likelihood that they will be passed during the winter session. It is expected that these subjects will be left for the general revision, although it is not improbable that hearings will be begun during the winter to pave the way for the work of the new Congress.

As far as internal revenue legislation is concerned, it seems safe to guess that the excess profits tax will disappear if other sources of revenue can be discovered. First in this line of substitute taxes will be the increase of various customs duties. A resumption of the schedules of the Paine-Aldrich bill for instance, would have netted almost one billion dollars of import duties on the imports of the last fiscal year, instead of $312,000,000 produced by the present law. The various excise taxes and luxury taxes will come in for similar treatment. If they can be abandoned without great sacrifice of treasury income, it is likely that Congress will drop a great many of them.

Secretary of the Treasury Houston is expected to renew his recommendation for the abolition of the excess profits tax in his forthcoming annual report, but it is not likely that the winter session of Congress will touch that task.

Chairman Fordney Will Continue

Under the rules of the House of Representatives, all revenue legislation, including customs duties and internal taxes, must be handled by the Ways and Means Committee and under the Constitution they must all originate in the House. Representative Fordney, of Michigan was re-elected last Tuesday and will remain as chairman of this committee. Representative Kitchin of North Carolina, was also re-elected and will remain as the ranking Democratic member.

In the Senate, the Finance Committee handles the same legislation. Its chairman, Senator Penrose of Pennsylvania, was re-elected on Tuesday and will remain at the head of this committee. The ranking Democratic member, Senator Simmons, of North Carolina, is the holdover senator and will remain on the committee.

The most important change in the chairmanships of the House committees in the 67th Congress will be the accession of Representative Winslow, of Massachusetts, to the chairmanship of the Interstate and Foreign Commerce Committee, which handles all railroad legislation. Representative McFadden, of Pennsylvania, will succeed to the chairmanship of the House Committee on Banking and Currency, succeeding Representative Platt, who has been made a member of the Federal Reserve Board.

Labor Legislation

There is much interesting speculation concerning the possibilities of labor legislation by the new Congress. The fact that President Gompers, of the American Federation of Labor, tried to marshal the union organizations of the country in behalf of the defeated party threatens to make him a less important character in future legislation than he has been during the last eight years. One result is the possibility that Congress will decline to continue the exemption of labor from the operations of the anti-trust laws. It may also discontinue the ban on the institution of the "Taylor shop management" in the management of government institutions. Both of these have been in the past made effective through riders on appropriation bills. Congress has never passed a law definitely exempting the unions from anti-trust legislation. It has merely provided that certain appropriations of money should not be used to enforce this legislation against unions. For that reason this exemption will lapse with the appropriations to which it is attached. There will be serious opposition to the continuance of the act in the coming appropriation bills.

The budget bill, which was vetoed by President Wilson last summer, has been amended to meet his objections and is pending in the Senate. It has already been adopted by the House, and may therefore become a law in the winter session. The budget system is not likely to become an effective part of the Government machinery, however, before the Harding administration comes into power.

The winter session of the present Congress lasts only from Dec. 6 to March 4—or about 10 working weeks. During that time, it seems likely that little except appropriation bills for the fiscal year ending June 30, 1922, will be considered. There is much talk about retrenchment in the various departments, but in the face of the need of a general reconstruction of the governmental machinery on a peace basis, it is difficult to say how much money will be saved in governmental expenses. The soldiers' bonus bill which was passed by the House,

but held in the Senate, will probably be the subject of considerable agitation, although its passage is extremely doubtful.

Senate Investigations

The Senate committee on education and labor, headed by Senator Kenyon of Iowa, which investigated last year's steel strike and later took up the recommendations of the President's industrial conferences, has not yet completed its report of suggestions to remedy industrial conditions. If such a report is made during the winter session, no action will be taken on it until the Sixty-seventh Congress assembles. The same fate is likely to meet the prospective report of the Calder construction committee's investigations.

Both in legislative as well as executive policies, the new administration is expected to be friendlier to "business"—large and small—than its predecessor. Much of the Federal interference and control, carried on under various wartime powers, is scheduled for an early disappearance. It is too early, however, to say how far this will be carried out by a change in administration acts and how much will be done by a revision of existing laws. In a great measure, it will, of course, depend upon the character of President Harding's cabinet selections. As to these there is now much speculation, most of it with little warrant.

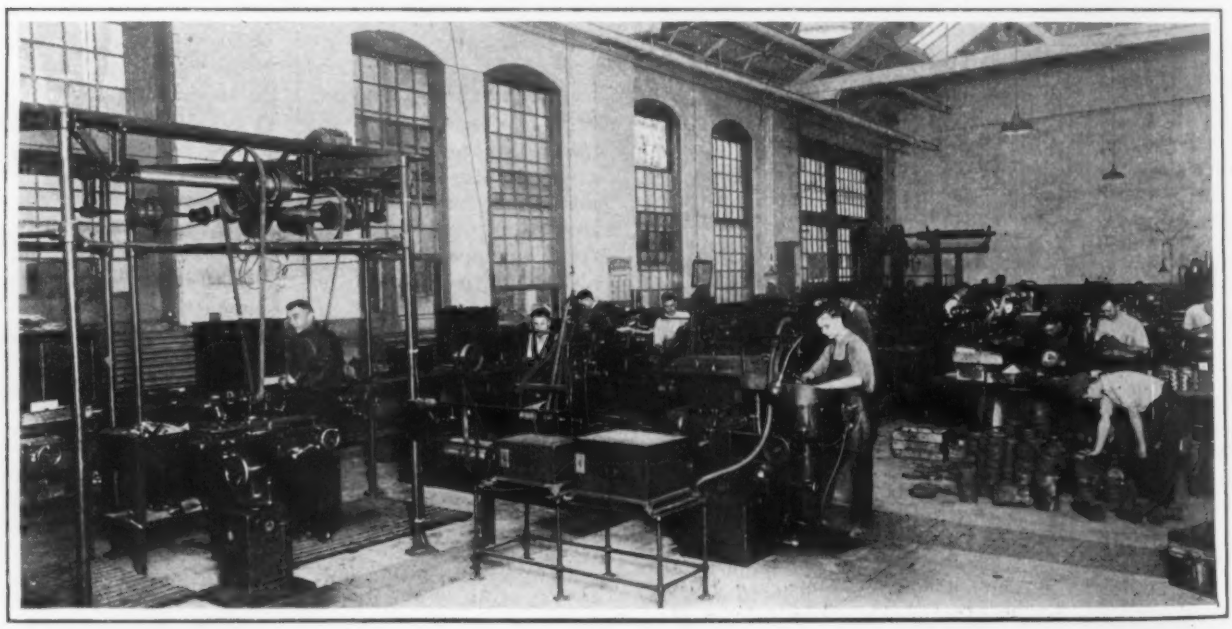
One thing which President-elect Harding has promised that is of great importance to industrial progress, is a reform of the diplomatic and consular service. The present conflict between the State and Commerce departments concerning the control of the consular service probably will be resolved in favor of the State department, but the new State department is expected to select men for diplomatic as well as consular posts who will be competent to gather information of genuine value to the extension of America's foreign trade.

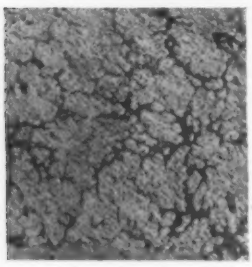
High-Speed Cast Steel Tools from the Electric Furnace

Practice of the United States High-Speed Steel & Tool Corporation in Making Tools Ready for Use in Any Desired Shape

BY STERLING H. BUNNELL*

THE melting, mixing and casting of steel alloys as a continuous operation with the electric furnace is already established for the commercial production of steel ingots to be further treated by hammering or rolling. In this way bars, sheets and strips are being produced for the manufacture of alloy steel parts of automobiles, for springs and for other purposes. In the early attempts to produce high-speed steel in forms suitable for direct use in the making of metal cutting tools nearly every casting proved to be defective. The occasional sound one, when made into a cutter, showed an endurance superior to that of the best high-speed steel tools made from forgings. It seemed a fair conclusion that the development of a successful process of producing proper castings of high-speed steel alloys would be of enormous value to the manufacturing industry generally, as well as to the inventor.

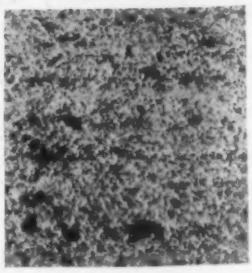




Machine Shop for Making Milling Cutters of Cast High-Speed Steel at the Plant of the United States High-Speed Steel & Tool Corporation

Photomicrograph (Left) of Section of Cast High-Speed Steel (Annealed) Showing Uniform Granular Structure

Photomicrograph (Right) of Longitudinal Section of High-Speed Steel Bar Stock (Annealed) Showing Fibrous Structure



The various steps which led to the present successful process of the United States High-Speed

*Consulting engineer, 103 Park Avenue, New York.

Steel & Tool Corporation commenced with a small electric furnace and testing equipment at Toledo, Ohio, in the last year of the European war. In this plant high-speed steel tool blanks were successfully cast in commercial quantities. A considerable number of finished tools, made from these blanks, were supplied to shops operating on war material. The tools performed so well that repeat orders were received far beyond the capacity of the Toledo plant. Continuous and careful study of the cast metal by physical and chemical tests and by the microscope showed that a uniform granular structure was characteristic and contrasted with the fibrous appearance of high-speed steel formed into shape by forging.

The company was finally able to develop a special heat-treating process for the finished tools which not only gave them superior cutting qualities, but did away with the usual loss by cracking in hardening. The sudden end of the war, however, interrupted the rapid development, then in progress, and delayed the adoption of plans for an adequate tool manufacturing plant to utilize the various processes.

During 1919 the manufacture of cast high-speed steel tools continued in a small way at the Toledo shop, while plans for a new plant at Green Island, near Troy, N. Y., were being prepared. This plant has only lately been completed. It is now producing castings of high-speed steel in cutter-blank sizes with a loss in defective castings of less than 10 per cent. The cutters produced from the blanks are uniformly without defect. A large number of cutters have been made and delivered in small trial lots to railroad, automobile and machine tool shops covering a wide range of work. Most users agree that the tools of cast metal will cut faster and longer than the best of forged high-speed steel, some results being as much as twice the amount of metal removed and twice the hours' run before grinding. There has not been an instance of a soft or defective tool of unsatisfactory cutting qualities.

The uniformity of the steel produced by the Green Island plant is due to the liberality with which testing methods and apparatus have been provided and are being used. The materials, principally soft steel scrap with vanadium, tungsten and chromium, and a flux, are accurately weighed before charging into the Rennerfelt electric furnace. When the metals are melted and just before pouring, a sample is taken, and tested for composition within a period of 15 min., while the charge is held to await the metallurgist's report. Test pieces are taken from every heat for further investigation, while other castings are stamped with the heat number and held for the final approval. In this way it is possible to insure a uniform composition in each and every heat.

The distinctive feature of this high-speed steel is its uniform cystalline structure, undisturbed by plastic distortion. The appearance of the section, as shown by photomicrographs, contrasts so strongly with high-speed steel made by any other process that this structure forms the basis of broad claims for patents now pending. This structure is not confined to the high-speed steel alloy alone, but is possessed also by other steel alloys made by the same process. Suitable steel alloys have been produced and cast, for other service than machining metals, requiring compositions differing from high-speed steel. The characteristic crystalline structure is the connecting link between all the steel alloys made by this process.

The present capacity of the Green Island plant is about seven tons of steel alloys per day. The equipment for manufacturing milling cutters and other special tools is planned for rapid production. The plant has ample floor space available for future expansion of the cutter-making department, but for the present there is a surplus of steelmaking capacity, enabling the production of special alloy steel castings for sale. As the steel requires special heat-treatment, the makers invite the purchasers of their high-speed steel castings to send the cutters when finished to the Green Island plant for hardening free of charge. The loss by cracking and hardening this steel by the special process is claimed to be practically zero.

DETROIT CONDITIONS

Business at Low Ebb, But Early Improvement Expected—Many Workers Leaving

DETROIT, Nov. 8.—The automobile industry and its allied lines are still running low—10 per cent to 50 per cent of capacity being about the figure. Even the Ford Motor Co. has laid off one of the three shifts entirely and is running the other two four days a week. The spurt in its sales resulting from the price reduction lasted only two or three weeks. Several of the large plants at Pontiac which have been shut down completely announce that they will open on Dec. 1 on a lighter schedule than before, and will receive applications from workmen commencing Nov. 15. On the other hand, one large company outside of Detroit laid off practically its entire force two weeks ago, taking in the time checks and announcing that the plant would be closed for three months.

The railroad stations are filled daily with men leaving for other parts of the country. Many negroes were imported during the past three years, and they are flocking to the South. There are plenty of houses vacant now, for the first time in several years. Rooming houses that have never had to do more than put a "furnished room" sign in the window for a few minutes to get more applicants than they could accommodate, are half full or empty. While prices of single rooms have been lowered time after time, without result, rental rates of flats and houses remain outrageously high. The landlords are apparently prepared to let them remain vacant for a time at present prices.

The domestic coal situation has eased up considerably. Anthracite coal has been obtainable from only a few dealers at $20 to $22, and soft coal has been held at about $16. At the present time there is an ample supply of both, at $18.50 and $13.50.

The banks are keeping a tight rein on loans, but are using good judgment in individual cases. A general betterment is looked for from now on, but nothing very heavy in the way of business is expected before the first of the year.

As far as can be seen, the automobile companies have curtailed expenditures in time to weather the next few months along present lines, with the exception of a few, perhaps one or two, of the smaller ones which have been on the edge continuously for several years. The general feeling here is that business, being almost at a standstill, cannot be much worse and probably will be better before long. Bank discounts here are not higher than 7 per cent. Renewals can be made as low as 6½ per cent. Collections are slow. Everyone is holding on to his cash and passing up discounts. Sixty and ninety days is becoming customary even with firms of the highest standing.

The amount of unfilled business on the books of the Lackawanna Steel Co., Buffalo, N. Y., on Sept. 30 last amounted to 277,482 tons, contrasted with 484,267 tons on June 30, previous. The company is booked ahead on rails and some sizes of bars well into 1921.

FERROMANGANESE SUPPLIES

Heavy Output Thus Far This Year—Available Supplies Ample

The production of ferromanganese by American blast furnaces in the first nine months of this year, according to the blast furnace reports of THE IRON AGE, has been heavy, and particularly so in the third quarter. The total for the nine months has been 210,306 gross tons, which is about 2000 tons in excess of the output in all of 1916 and over 30,000 tons greater than in all of 1919.

The spiegeleisen output to Oct. 1, 1920, has been 86,070 tons which, while in excess of the 1919 production by over 20,000 tons, is still relatively small as compared with the war output and about on a par with the pre-war figures.

The following table gives the production of ferromanganese and spiegeleisen for the first nine months of 1920 and a comparison with some recent years:

Ferromanganese and Spiegeleisen Output in the United States in Gross Tons

	Ferromanganese	Spiegeleisen	Total	Average Per Month
Total, first half 1920.	124,104	58,952	183,056	30,509
July	29,864	6,925	36,789	....
August	28,652	8,333	36,985	....
September	27,686	11,860	39,546	....
Total to Oct. 1, 1920..	210,306	86,070	296,376	32,930
Total, 1919	179,029	65,391	244,470	20,732
Total, 1918	345,306	249,002	594,308	49,525
Total, 1916	208,389	197,518	405,807	33,817
Total, 1914	106,083	100,365	206,448	17,204
Total, 1913	119,495	126,081	245,576	20,464
October, 1920	25,690	9,000	34,690	....

The monthly output of ferromanganese to Oct. 1, 1920, has been 23,369 tons per month, which compares with 20,684 tons per month for the first half. This increased rate is due to the heavy production in the third quarter, which was 86,202 tons, or 28,734 tons per month. That a slowing down has taken place is shown by the October output of 25,690 tons.

The spiegeleisen production to Oct. 1, this year, has been at the rate of 9563 tons per month, which is larger than 1919, when it was 7266 tons per month. The output each month has been erratic, being heavy one month and light another. In neither case does the production approach the war or 1913 record.

Available Supplies of Ferromanganese

The available supplies of ferromanganese for the first nine months of 1920, as compared with other periods, are as follows, as obtained from an analysis of the output, imports and exports:

	Output	Imports	Exports	Available Supply
Total, first half 1920....	124,104	21,263	544	....
July	29,864	2,448	417	31,895
August	28,652	9,804	252	38,204
September	27,686	6,524	297	33,913
Total to Oct. 1, 1920.....	210,306	40,039	1,510	....
Average per month to Oct. 1, 1920	23,369	4,449	168	27,650
Average per month, 1919.	14,923	2,752	255	17,420
Average per month, 1918.	28,775	2,264	298	30,741
Average per month, 1917.	21,486	3,703	776*	25,413
Average per month, 1915.	12,021	4,605	....	....
Average per month, 1913.	9,958	10,672	....	....
Five-year aver. (1910-14)	8,280	8,399	....	....

*First half only.

There is a distinct increase in the rate of importations of ferromanganese from Great Britain. To Oct. 1, this year, there has been 4449 tons per month, which is the heaviest since 1915, when they were 4605 tons per month. Exports of this alloy are still relatively insignificant.

Available supplies thus far this year have been gaining in volume. There has been an increase of nearly 3500 tons per month, as between the first half and the first nine months, or 24,138 tons as contrasted with 27,650 tons per month to Oct. 1. The latter is second only to the signal record made in 1918, when the available supply was 30,741 tons per month. For August alone this supply was theoretically 38,204 tons.

Manganese Ore Imports

There has been a continued increase in the supply of manganese ore, especially in the third quarter. The data is as follows:

Manganese Ore Imports in Gross Tons

	Total	Average Per Month
Total, first half 1920.....	216,542	36,090
July	18,449	....
August	99,601	....
September	88,422	....
Total to Oct. 1, 1920.....	423,014	47,001
Total, 1919	332,344	27,779
Total, 1918	491,303	40,942
Total, 1917	629,972	52,498
Total, 1915	320,784	26,732
Total, 1913	345,084	28,858

This expansion in the third quarter, when the imports in August and September totalled more than 188,000 tons, brings the monthly import rate to 47,001 tons per month for the nine months to Oct. 1, which is second only to the phenomenal importations of 52,498 tons per month in the war year, 1918.

British Imports of Ore

Receipts of manganese ore in Great Britain are also on the increase. The following table shows that country's imports this year to Oct. 1 and for former years:

British Imports of Manganese Ore

	Total	Average Per Month
Total, first half 1920.....	187,349	31,228
July	46,523	....
August	50,574	....
September	50,934	....
Total to Oct. 1, 1920.....	335,380	37,264
Total, 1919	265,800	22,150
Total, 1918	365,606	30,467
Total, 1917	331,264	27,605
Total, 1915	377,324	31,443
Total, 1913	601,177	50,098

The importations in the third quarter of over 147,000 tons are not far from the total receipts for the entire first half of 1920, making the imports to Oct. 1 at the rate of 37,264 tons per month against 31,228 tons per month to July 1. The present rate has only been surpassed in 1913, when they were 50,098 tons per month.

Supplies and Needs in 1920

In THE IRON AGE, May 13, it was estimated that with a steel output for this country in 1920 of 45,000,000 gross tons, there would be required 306,000 gross tons of ferromanganese or, with the 10,000 tons used in the iron foundry industry, 316,000 tons. This would mean theoretically a consumption of 26,330 tons per month. The foregoing analysis shows available supplies at the end of the first nine months of 27,650 tons per month. The conclusion is that the needs of the steel industry can be amply supplied even if present rates of output and imports are curtailed slightly.

Similar reviews of the manganese-iron alloy situation appeared in THE IRON AGE Dec. 6, 1917; Jan. 31, 1918; April 11, 1918; July 25, 1918; Dec. 28, 1918; Feb. 20, May 15, Aug. 28, Dec. 4, 1919; Feb. 19, May 13 and Sept. 2, 1920.

Reparation Refused

WASHINGTON, Nov. 9.—In an adverse decision on the complaint of Frank Samuel of Philadelphia, asking reparation on a shipment of chrome ore returned from Pottsville, Pa., to Conshohocken, the Interstate Commerce Commission has reaffirmed its rule that a commodity rate covering shipments in one direction need not compel the establishment of a similar rate on the opposite route. The shipment in question had been refused by the consignee and the Philadelphia & Reading Railway had assessed a rate of 15c. per 100 lb. for the return shipment, although the west-bound charge was $1.50 per long ton.

The Union Rolling Mill Co., Unionville, Conn., has filed with the secretary of that state a preliminary certificate of dissolution.

LEAN GAS AS BOILER FUEL*

Low Grade Coals Used in Coke Ovens and Coke Utilized in Gas Producers

Engineers and works managers are frequently heard to express certain doubts as to the possibility of obtaining complete combustion with gas of very low calorific value without the use of supplementary heat furnished by preheating the air destined to support this combustion.

Difficulties in lighting and in maintaining a stable combustion are feared, and it is commonly considered to be of prime necessity to provide for an excess of air in order to insure the gas being completely burned. For this reason a short description of the tests recently made on firing a water tube boiler with lean producer gas at Montrambert, France, may be of interest.

Experiments have been carried on during latter years by the Société des Houillères de Montrambert et de la Béraudière, of St. Etienne, France, for the purpose of utilizing the slack from their mines and their low grade coals. A test works of 500 kw. capacity furnishes the power used in the exploitation of the shafts at Montrambert, and produces a surplus which is turned on to the distribution system of the Cie. Electrique de la Loire et du Centre, with which this installation is connected.

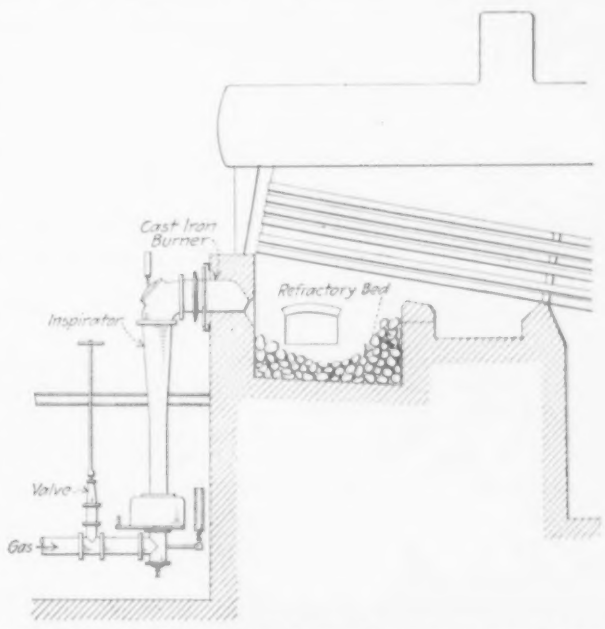
In order to utilize this slack and mine waste, which is a coking fuel containing 42 to 45 per cent of moderately fusible ash and 18 to 20 per cent of volatile matter, the coal is first charged into coke ovens, the by-products being recuperated and the waste heat employed for steam generation; the coke thus formed is next utilized in gas producers and the gas produced is employed in two internal combustion engines for generation of electrical power. Since this gas is to be used in internal combustion motors, its purification is necessary. Even if the gas were destined for industrial furnaces or boilers it would be worth while in most cases to purify it to a certain extent and to recover, as far as possible, the condensable by-products and the sensible heat.

Their installation of two 10-ft. rotating grate producers is therefore completed by purifying and cooling apparatus which insures the deposit of the dust and tar contained by the gas, and which cools and dries it, preheating the air blast for the producers at the same time. In this same apparatus the hot air is saturated with water and the proportion between the weights of water vapor and air furnished to the producer is easily controlled by regulating the temperature of the air. The gas after its passage through this apparatus is discharged by an extractor into a series of purifying cases and finally passes to a holder from which it is drawn by the suction of the gas engines. A supplementary installation recuperates the nitrogen content in the coke, of which about 70 per cent is recovered in the form of ammonia salts. The further recovery of sulphur compounds and other products is being studied.

The works has been in normal operation for about two years and its operation has been so successful that the Société de Montrambert is at present considering the construction of a large works comprising coke ovens and producers capable of handling all the low grade coal and non-salable waste produced by its various mines. It was as part of this project that this company decided in 1919 to experiment upon the use of the available producer gas for the firing of boilers in order to determine whether this gas was suitable under practical conditions for such an application and also to find out what efficiency could be expected of a boiler so fired, and whether it would be advantageous to provide batteries of boilers supplying turbo-generator groups instead of internal combustion motors. For this test they chose the boiler installed near the battery of coke ovens and which is normally heated by waste gases from the latter. This boiler is of the Büttner water tube type, having a heating surface of 80 sq. m. (about 860 sq. ft.), and is installed in the open air, without economizer or feed water heater. It had been in operation for about ten years and the tubes were fouled by the tar and the lampblack deposited by the waste gases coming from the coke ovens. Prior to the test the interior of the tubes was cleaned, but it was impossible to reach the exteriors in order to remove scale and soot, which fact probably reduced the boiler efficiency to some extent.

For the firing of this boiler the principle of "surface combustion" was used, employing the process and equipment of the Surface Combustion Co., New York. This process, briefly, consists in mixing intimately the gas with the air necessary for its combustion in their proper proportions and in projecting this mixture into a porous bed of refractory material at a speed sufficient to avoid back firing. Almost instantaneous combustion takes place in contact with the hot surfaces of the refractory pieces composing this bed, which is rapidly brought to incandescence and serves as a source and reservoir of radiant heat.

One of the accompanying illustrations shows a lon-



Büttner Water Tube Boiler, Arranged for Tests Using Lean Producer Gas as a Fuel

gitudinal section of the boiler fire box transformed for the use of gas. The gas was drawn from the holder by a Roots blower, which raised it to a pressure of 12 in. to 16 in. of water and transmitted it through an overhead pipe line to the boiler. This pressure is employed in the inspirator, consisting of a gas nozzle and Venturi throat, to inspirate from the atmosphere the full quantity of air necessary for the complete combustion of the gas. The high velocity of the gas and air passing through the throat completes their intimate mixture, and this mixture is delivered, under pressure, to the cast iron burner, which discharges it at a suitable velocity into the refractory bed. The gas consumption and therefore the rate of evaporation of the boiler are regulated by the operation of a valve in the gas supply line as long as the quality of the gas remains approximately constant. Since a draft is not necessary for the operation of this system, the boiler was isolated from its stack and a small brick flue was built against the rear of the setting mounting to the same height as the latter, into the bottom of which flue the waste gases were discharged from the breeching. A small register in this flue permitted the control of the pressure in the boiler setting.

The boiler was cold when first started up and contained water up to the normal operating level. The burner was lit by means of a small torch of oily waste. At the end of 40 min. of heating the boiler was in full operation at 120 lb. pressure.

The average production of steam was found to be 1900 kilos per hr. (4200 lb.), with a gas consumption of 2485 cu. m. (87,800 cu. ft.) per hr., measured at the holder, and of 1990 cu. m. (70,300 cu. ft.) per hr., measured by the nozzle in the inspirator. Since the

*From a monograph by John H. Bartlett, Jr., Surface Combustion Co., 366 Gerard Avenue, New York.

temperature at the holder averaged 49 deg. C., and the gas was saturated with water vapor at this temperature, the consumption calculated for the holder was corrected for the normal pressure and temperature at the works laboratory, account being taken of the volume of water vapor contained. The above figure then becomes 1970 cu. m. per hr. (69,600 cu. ft.) at 718 mm. and 15 deg. C., which checks quite well with the consumption calculated from the pressure at the inspirator nozzle, or, correcting to 0 deg. C. and 760 mm., 1765 cu. m. (62,300 cu. ft.) per hr. In round figures, therefore, 1 cu. m. of gas produced 1 kg. of steam (16 cu. ft. of gas produced 1 lb. of steam). The calorific value of the gas was controlled by a Junkers calorimeter, and varied during the test from 813 to 902 calories per cu. m. (91.3 to 101 B. t. u. per cu. ft.), average 856 at 15 deg. C. and 718 mm. (96.3 B. t. u.). From these figures the overall thermal efficiency of the boiler is figured as equal to 73.3 per cent. This efficiency could without doubt be improved with a clean boiler well constructed with a view to economy. The coke consumption of the producer averaged 450 kilos (1000 lb.) per hr., 45 per cent ash content, calorific value not over 4000 calories per kilo (7200 B. t. u. per lb.).

The pressure and temperature of the flue gases were measured: Near the bridge wall a pressure of 5 mm. of water was found, and immediately before the register in the small chimney there was a suction of 5 mm. At the same place the temperature of the gases was 344 deg. C. on Dec. 20 and 354 deg. C. on the 21st.

Frequent flue gas analyses were made; the average of these was 17.9 per cent CO_2, with sometimes several tenths per cent CO and at other times a slight percentage of oxygen, according as the gas varied in quality.

The samples taken at the bridge wall checked well with those at the breeching, showing that combustion was complete in the fire box before contact of the gas with the tubes.

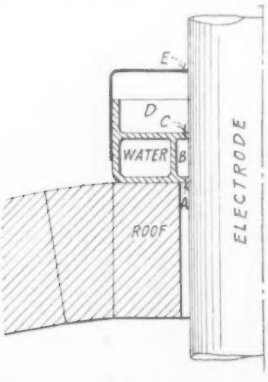
In view of the satisfactory results which these first tests have given, the Société des Houillères de Montrambert et de la Béraudière is considering at present the use of producer gas for firing an important battery of boilers as a part of a large project for the utilization of its waste coal.

Heat Losses Through Electrodes in Electric Furnaces

The Causes and Conditions Governing Them—The Brooke Electrode Economizer and How It Functions

BY FRANK HODSON*

AN excellent paper was recently presented before the American Electrochemical Society, at its fall meeting in Cleveland, Sept. 30, Oct. 1 and 2, by M. R. Wolfe and V. de Wysocki on the heat losses through electrodes on a 3-electrode 6-ton furnace. [Abstracted in THE IRON AGE Oct. 28.] The figures given in this paper will,



Section View of Furnace Roof With Brooke Electrode Economizer in Place

A 3-Ton Greaves-Etchells Electric Furnace Is Shown (Right) Equipped with the Cooling Rings or Economizers

no doubt, surprise many electric furnace users as to the amount and cost of power they are losing through the furnace roof. After a close study of this particular problem for the last four years, the writer is surprised that the losses recorded were not larger. If the amount of heat in the shape of flame that escapes from most furnace roofs were taken fully into account, the loss would be found to be nearer 30 than 18.7 per cent. The method employed by the authors of the paper, while giving actual heat losses from the electrodes, only gives heat absorbed by the water cooler. A great deal more than this is usually lost.

Conditions Governing Heat Losses

In considering these heat losses, which perhaps would be better described as through the furnace roof rather than through the electrodes, it is important to consider how the conditions governing the loss of heat and power can be improved. Broadly speaking, the causes are:

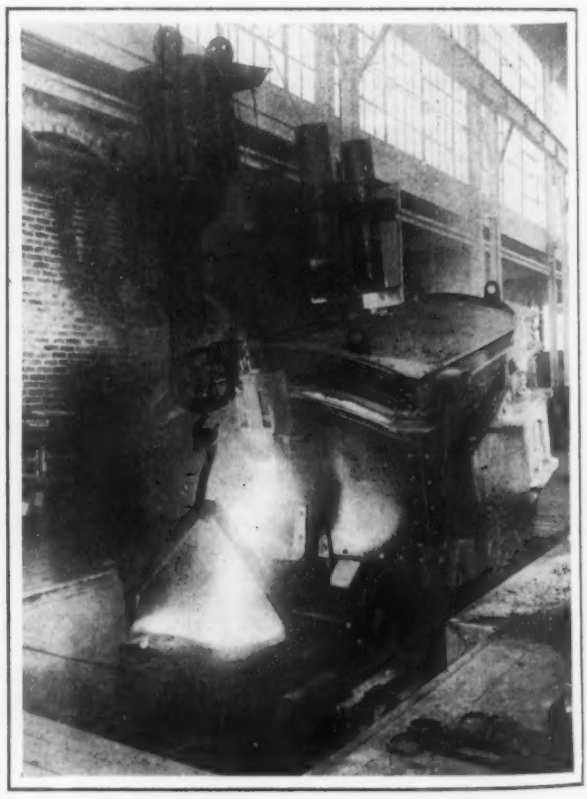
Heating up of the electrode due to faulty electrode joint or defective electrode.

Heating up of the electrode due to imperfect contact or badly designed electrode holders.

Heating up of the electrode due to electrode pencilling off at point of arc.

Heating up of the electrode due to oxygen from the air combining with the carbon of electrode and burning off.

Special care should always be taken in jointing up



electrodes. Troubles due to this become increasingly worse as the melt proceeds. Good quality electrodes can now be purchased and it is best to pay even a little higher price for proved electrodes.

Design of the electrode holder should be carefully considered and changed if undue losses occur. With proper contact, little or no heating should occur here.

*President Electric Furnace Construction Co., Philadelphia.

On our own furnaces we have not found it necessary to install water-cooled holders, looking upon these as an admission of failure to get proper electrical contact.

Penciling of Electrodes

This is probably the indirect cause of more heat losses than any other feature. It is accentuated in cases where two large a space is left between the electrodes and the cooling ring, or where the furnace doors are not kept properly closed at the bottom, or where, as in some cases, the melter has to unduly open the doors to inspect or rabble his molten charge. The air strikes the white-hot electrode and burns away carbon, the hole in the roof acts as a flue draft and the electrode pencils off, so that the area at the bottom, where the arc is, is often only one-fifth of what the furnace builders have designed to carry the power behind the furnace. The current continues to flow through this restricted area of electrode, and its resistance to the excessive current over the smaller area results in the whole electrode heating up, instead of going into the arc. This also causes trouble with the joints, with the holders and on all the outside electrical connections. Sometimes large pieces or flakes of electrodes break off, due to the increased resistance.

With the above facts in mind, our metallurgists have been working for the last five years to prevent this penciling and heating up of electrodes. It was realized early in the investigation that if the flame could be prevented from blazing out at the top that one of the chief causes would be overcome. Experiments have been made with over a dozen different types of water coolers, and also attempts were made to insert an inert gas under the furnace roof.

The Brooke Electrode Economizer

As a result of these experiments, F. W. Brooke, vice-president Electric Furnace Construction Co., has developed a type of electrode cooling ring or "electrode economizer," now fitted as standard on all Greaves-Etchells furnaces, which prevents this flame and consequent penciling of electrodes and other troubles caused thereby. These economizers have been fitted to a number of furnaces and have stood up remarkably well. Some have been in constant operation for six months and are as good now as the day installed. The invention is covered by patents but the company can supply these for all types of furnace. A brief description follows:

The Brooke economizer depends for its action on the scientific principle that hot gases under pressure, if suddenly allowed to expand, quickly lose their high temperature. The gases generated in an electric furnace are only combustible at high temperature and in the presence of oxygen. All other cooling rings simply content themselves with cooling these burning gases. In the Brooke economizer the gases never ignite, the roof ports and the electrode are kept reasonably cool and the gases leaving the furnace are at too low a temperature to ignite.

The gases pass first of all in between the electrode and the port-hole roof, and then through the small clearance, marked A in one of the illustrations, into the cooling ring and into a relatively larger chamber, B, which causes the expansion of the gases, thereby giving up a large amount of sensible heat in the gases. This heat is absorbed by the water in the cooling ring. From chamber B they are once more contracted through the small clearance, C, and then passed to a very large chamber, D, for a second and chief expansion. The design differs slightly with amorphous or graphite carbon electrodes, but the effect is that no flame is seen from the top of the furnace and the electrodes do not pencil off.

The other illustration, that of a 3-ton Greaves-Etchells furnace at the Dodge Steel Co., Tacony, Pa., shows the actual size of the cooling ring, and it will be noticed that, although the electrodes are withdrawn and the furnace is pouring, there is no flame or reduction of diameter. Even when carbon is thrown on the slag, no flame appears. On a recently installed 4-electrode furnace, the monthly figures were 12½ lb. of graphite electrodes per ton. The average over six months was 13 lb.

RAILROAD EARNINGS

Returns Fall Below Expectations of Interstate Commerce Commission

WASHINGTON, Nov. 9.—Earnings of the railroads for September, the first month of the increased freight and passenger rates and with no Government guaranty, can now be estimated fairly accurately. Figures on 160 out of 187 Class 1 railroads as compiled by the Bureau of Railway Economics indicate that all the roads will show net earnings of about $80,000,000 for September, whereas if the annual return on the properties were to be 6 per cent, the September earnings should be about $109,000,000.

These figures, while showing that the net returns are falling below what the Interstate Commerce Commission expected when it approved the new rates, yet are not necessarily conclusive as indicating that the new schedules are not adequate. It is expected that October will furnish a more satisfactory test of the new rates, inasmuch as much of the traffic handled during September was started on the old rates. In any event, it is stated positively by railway officials that they would not think of suggesting further increases at least until the present scale has been in operation for six months or more.

Railroad traffic has increased to such an extent during the past few weeks that there is every possibility that the October earnings may be up to the level desired. There is a question, however, as to whether present satisfactory conditions will continue in view of business conditions, the curtailing of output of factories and a general slowing down as a result of declining prices and decreased purchasing.

The total operating revenue of the 160 railroads for which figures are available for the month of September increased approximately 25 per cent over the operating revenues of September, 1919. The freight rates were increased an average of 35 per cent over the entire country and passenger fares 20 per cent.

There was an increase in operating expenses for the month of September of approximately 28 per cent over September, 1919. The net operating income increased about 4 per cent.

Final figures for earnings of railroads in August have just been issued by the Bureau of Statistics of the Interstate Commerce Commission. They show a total net deficit of $154,810,774 for the eight months ending with August. This deficit presents a total loss to the Government for the eight months ending with August of $754,810,774. This period includes January and February, when the railroads were still under Federal control, and the six months guaranty period from March 1 to Sept. 1, when railroads were guaranteed against operating deficits and assured a standard return of $75,000,000 a month. The cost to the Government for the six months guaranty period following the return of the roads to private control was approximately $650,000,000.

Iron Deposits of Montana

WASHINGTON, Nov. 9.—The United States Geological Survey has issued a short bulletin "715—F" concerning the deposits of iron ore near Stanford, Mont. The bulletin, which may be obtained upon application to the Survey, was prepared by Lewis G. Westgate. It covers the iron ores known as the Running Wolf hematite deposits, in Cascade and Fergus counties, in central Montana, on Running Wolf and Dry Wolf creeks, 12 miles southwest of Stanford, on the Great Northern Railway, and about 54 miles southeast of Great Falls. They lie just within the northern border of the Little Belt Mountains.

The document estimates approximately 1,000,000 gross tons of ore for the Eastern claims, and 1,340,000 gross tons for the Western group.

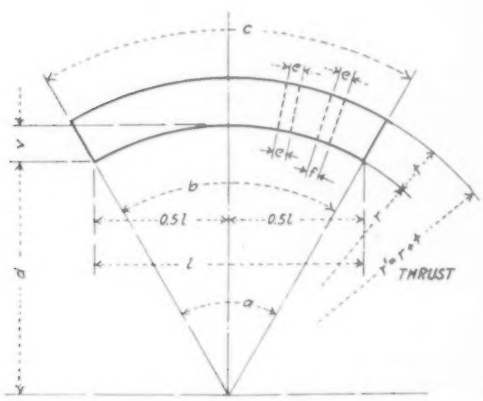
ARCH BRICK WORK

Formulas and Tables for Fantail or Taper Arches

BY A. D. WILLIAMS

Tables giving the number of shape and straight brick required to make a complete circle are found in many of the firebrick and facebrick catalogs. These are very convenient, as far as they extend, in regard to the standard shapes, but are of comparatively little assistance in working out the shapes required for "fantail" or taper arches, which may be built either of standard or special shapes as desired, or for conical or skew arches.

The accompanying tables were computed to facilitate the working out of arch shapes, and it is believed that the accompanying diagram supplies sufficient information to facilitate their use. They have been carefully computed and checked, but the writer will be grateful to anyone who will call his attention to any errors which may have been made in the tables.



In the diagram the letters and following formulas correspond:

(1) $r = \dfrac{(0.5\,l)^2 + v^2}{2\,v}$

(2) $\sin \dfrac{a}{2} = \dfrac{0.5\,l}{r}$

(3) $b = \dfrac{6.2832\,r \times a\ (\text{deg.})}{360}$

or $= 0.01754\ r \times a\ (\text{deg.})$

(4) $d = r - v$

(5) $r' = r + t$

(6) $c = 0.01754\ r' \times a\ (\text{deg.})$

(7) $k = c - b$

(8) $g = e - f$

(9) $\dfrac{c}{e} = n =$ Total number of brick in span

(10) $\dfrac{k}{g} = n' =$ Number of taper brick in span.

(11) $n - n' = n'' =$ Number of straight brick in span.

Thrust, uniform loading $= T_u = \dfrac{3\,P_u\,l}{2\,v}$

Thrust, concentrated load $= T_c = \dfrac{3\,P_c\,l}{v}$

P_u = Uniform load, pounds per sq. ft.

P_c = Concentrated load in pounds at center of span.

When several concentrated loads are to be considered, reduce to an equivalent concentrated center load.

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Formulas and Tables for Arch Brick

FIREBRICK ARCHES; Rise, Length, Radius, for CHORD of Unity.

No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8
Rise or Middle Ordinate Decimal of Span or Chord	Logarithm of Rise or Middle Ordinate	Rise or Middle Ordinate Inches per 1 ft. Span or Chord	Arc	Length of Arc	Logarithm of Length of Arc	Radius of Arc	Logarithm of Radius of Arc
v	log. v	v	a deg. min. and sec.	b or c	log. b log. c	r or r'	log. r log. r'
0.0300	8.47712	.....	13-44-04	1.00240	0.00104	4.1816	0.62135
0.0313	8.49485	3/8	14-19-42	1.00261	0.00113	4.0092	0.60306
0.0328	8.51550	.....	15-00-00	1.00285	0.00124	3.8307	0.58327
0.0339	8.52961	13/32	15-30-52	1.00305	0.00132	3.7043	0.56871
0.0350	8.54407	.....	16-01-00	1.00327	0.00142	3.5889	0.55496
0.0365	8.56180	7/16	16-19-05	1.00355	0.00154	3.4429	0.53693
0.0391	8.59176	15/32	17-53-09	1.00407	0.00176	3.2313	0.50738
0.0400	8.60206	.....	18-17-44	1.00426	0.00185	3.1450	0.49762
0.0417	8.61979	1/2	19-04-11	1.00462	0.00192	3.0254	0.47978
0.0443	8.64612	17/32	20-11-00	1.00522	0.00226	2.8535	0.45538
0.0450	8.65321	.....	20-34-18	1.00539	0.00233	2.8002	0.44719
0.0469	8.67094	9/16	21-26-23	1.00585	0.00253	2.6887	0.42954
0.0493	8.69237	.....	22-30-00	1.00645	0.00279	2.5629	0.40873
0.0495	8.69442	19/32	22-36-56	1.00652	0.00282	2.5500	0.40654
0.0500	8.69897	.....	22-50-32	1.00665	0.00288	2.5250	0.40226
0.0521	8.71670	5/8	23-47-44	1.00723	0.00313	2.4254	0.38476
0.0547	8.73789	21/32	24-58-24	1.00796	0.00344	2.3125	0.36409
0.0550	8.74036	.....	25-06-34	1.00805	0.00348	2.3002	0.36177
0.0573	8.75809	11/16	26-09-01	1.00873	0.00378	2.2102	0.34442
0.0599	8.77740	23/32	27-19-34	1.00954	0.00412	2.1168	0.32567
0.0600	8.77815	.....	27-22-16	1.00957	0.00414	2.1133	0.32497
0.0625	8.79588	3/4	28-30-00	1.01088	0.00470	2.0314	0.30776
0.0650	8.81291	.....	29-37-42	1.01123	0.00485	1.9555	0.29126
0.0651	8.81361	25/32	29-40-22	1.01127	0.00487	1.9527	0.29063
0.0658	8.81840	.....	30-00-00	1.01153	0.00498	1.9319	0.28397
0.0677	8.83064	13/16	30-50-42	1.01217	0.00525	1.8802	0.27421
0.0700	8.84510	.....	31-52-43	1.01302	0.00562	1.8207	0.26024
0.0703	8.84703	27/32	32-00-48	1.01313	0.00567	1.8132	0.25846
0.0729	8.86283	7/8	33-06-09	1.01410	0.00608	1.7552	0.24432
0.0750	8.88081	.....	34-07-23	1.01493	0.00644	1.7042	0.23151
0.0755	8.87807	29/32	34-20-50	1.01513	0.00652	1.6934	0.22875
0.0781	8.89279	15/16	35-30-42	1.01618	0.00697	1.6396	0.21473
0.0800	8.90309	.....	36-21-42	1.01698	0.00731	1.6025	0.20479
0.0807	8.90703	31/32	36-40-23	1.01728	0.00728	1.5893	0.20120
0.0826	8.91672	.....	37-30-00	1.01807	0.00778	1.5555	0.19187
0.0833	8.92082	1	37-50-04	1.01841	0.00742	1.5422	0.18815
0.0850	8.92942	.....	38-35-32	1.01916	0.00824	1.5131	0.17986
0.0859	8.93418	1 1/32	38-59-32	1.01956	0.00841	1.4982	0.17656
0.0885	8.94714	1 1/16	40-08-58	1.02075	0.00892	1.4567	0.16336
0.0900	8.95424	.....	40-49-03	1.02146	0.00922	1.4339	0.15652
0.0911	8.95974	1 3/32	41-18-14	1.02197	0.00944	1.4177	0.15158
0.0938	8.97197	1 1/8	42-30-03	1.02329	0.00999	1.3795	0.13973
0.0950	8.97772	.....	43-08-26	1.02389	0.01025	1.3663	0.13355
0.0964	8.98387	1 5/32	43-39-42	1.02460	0.01055	1.3446	0.12858
0.0990	8.99545	1 3/16	44-47-58	1.02593	0.01112	1.3121	0.11797
0.0995	8.99763	.....	45-00-00	1.02617	0.01122	1.3066	0.11613
0.1000	9.00000	.....	45-14-23	1.02646	0.01134	1.3000	0.11394
0.1016	9.00673	1 7/32	45-56-36	1.02731	0.01170	1.2811	0.10760
0.1042	9.01773	1 1/4	47-04-35	1.02871	0.01229	1.2520	0.09761
0.1050	9.02119	.....	47-26-20	1.02914	0.01247	1.2430	0.09446
0.1068	9.02845	1 9/32	48-13-44	1.03015	0.01290	1.2238	0.08771
0.1094	9.03892	1 5/16	49-16-16	1.03162	0.01352	1.1995	0.07900
0.1100	9.04139	.....	49-37-47	1.03196	0.01366	1.1914	0.07604
0.1120	9.04914	1 11/32	50-30-12	1.03312	0.01415	1.1721	0.06895
0.1146	9.05912	1 3/8	51-38-13	1.03466	0.01476	1.1481	0.05996
0.1150	9.06070	.....	51-48-39	1.03490	0.01490	1.1445	0.05860
0.1167	9.06664	.....	52-30-00	1.03593	0.01533	1.1305	0.05326
0.1172	9.06888	1 13/32	52-46-04	1.03623	0.01546	1.1252	0.05121
0.1198	9.07843	1 7/16	53-53-47	1.03784	0.01613	1.1033	0.04270
0.1200	9.07918	.....	53-58-58	1.03797	0.01619	1.1017	0.04205
0.1224	9.08777	1 15/32	55-01-11	1.03949	0.01682	1.0825	0.03442
0.1250	9.09691	1 1/2	56-08-42	1.04116	0.01752	1.0625	0.02633
0.1276	9.10586	1 17/32	57-15-54	1.04287	0.01823	1.0434	0.01846
0.1300	9.11394	.....	58-17-48	1.04447	0.01890	1.0265	0.01138
0.1302	9.11464	1 9/16	58-22-57	1.04461	0.01895	1.0252	0.01079
0.1328	9.12324	1 19/32	59-29-50	1.04638	0.01969	1.0077	0.00332
0.1340	9.12702	.....	60-00-00	1.04715	0.02002	1.0000	9.00000
0.1350	9.13033	.....	60-26-18	1.04792	0.02033	0.9934	9.99714
0.1354	9.13167	1 5/8	60-37-28	1.04820	0.02040	0.9907	9.99593
0.1400	9.14613	.....	62-43-28	1.05147	0.02180	0.9607	9.98259
0.1406	9.14806	1 11/16	62-49-26	1.05190	0.02197	0.9594	9.98198
0.1450	9.16137	.....	64-41-19	1.05516	0.02332	0.9346	9.97061
0.1458	9.16386	1 3/4	65-01-39	1.05576	0.02357	0.9302	9.96859
0.1500	9.17609	.....	66-47-30	1.05869	0.02488	0.9085	9.95825
0.1510	9.17910	1 13/16	67-13-02	1.05973	0.02520	0.9033	9.95584
0.1517	9.18091	.....	67-30-00	1.06034	0.02545	0.9000	9.95423
0.1550	9.19033	.....	68-53-37	1.06288	0.02649	0.8840	9.94643
0.1563	9.19382	1 7/8	69-26-13	1.06392	0.02691	0.8779	9.94344
0.1600	9.20412	.....	70-58-44	1.06693	0.02814	0.8613	9.93513
0.1615	9.20806	1 15/16	71-36-06	1.06816	0.02864	0.8547	9.93184
0.1650	9.21748	.....	73-03-06	1.07109	0.02983	0.8401	9.92432
0.1667	9.22185	2	73-44-08	1.07254	0.03042	0.8334	9.92084
0.1697	9.22975	.....	75-00-00	1.07511	0.03145	0.8213	9.91452
0.1700	9.23045	.....	75-00-44	1.07537	0.03156	0.8203	9.91397
0.1719	9.23521	2 1/16	75-53-30	1.07702	0.03222	0.8131	9.91015
0.1750	9.24551	.....	77-09-36	1.07977	0.03333	0.8018	9.90406
0.1771	9.24818	2 1/8	78-01-12	1.08165	0.03409	0.7943	9.90001
0.1800	9.25527	.....	79-11-44	1.08428	0.03514	0.7844	9.89456
0.1823	9.26077	2 3/16	80-07-39	1.08639	0.03599	0.7768	9.89033
0.1850	9.26717	.....	81-13-04	1.08890	0.03699	0.7682	9.88546
0.1875	9.27300	2 1/4	82-13-27	1.09126	0.03793	0.7604	9.88105
0.1882	9.27459	.....	82-30-00	1.09193	0.03819	0.7583	9.87986
0.1900	9.27875	.....	83-13-38	1.09365	0.03888	0.7529	9.87673
0.1927	9.28490	2 5/16	84-13-17	1.09625	0.03991	0.7456	9.87253
0.1950	9.29003	.....	85-13-23	1.09850	0.04080	0.7385	9.86837
0.1979	9.29648	2 3/8	86-22-29	1.10137	0.04233	0.7306	9.86367
0.2000	9.30103	.....	87-12-20	1.10347	0.04276	0.7250	9.86034
0.2031	9.30776	2 7/16	88-27-14	1.10660	0.04399	0.7169	9.85543
0.2050	9.31175	.....	89-26-10	1.10855	0.04476	0.7106	9.85164
0.2071	9.31619	.....	90-00-00	1.11072	0.04560	0.7072	9.84949
0.2083	9.31876	2 1/2	90-29-34	1.11196	0.04605	0.7041	9.84762
0.2100	9.32222	.....	91-41-32	1.11374	0.04680	0.6969	9.84315

Formulas and Tables for Arch Brick

FIREBRICK ARCHES; Rise, Length, Radius, for CHORD of Unity.

No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8
Rise or Middle Ordinate Decimal of Span or Chord	Logarithm of Rise or Middle Ordinate	Rise or Middle Ordinate Inches per 1 ft. Span or Chord	Arc	Length of Arc	Logarithm of Length of Arc	Radius of Arc	Logarithm of Radius of Arc
v	log. v	v	a deg. min. and sec.	b or c	log. b log. c	r or r'	log. r log. r'
0.2135	9.32948	2 9/16	92-29-24	1.11743	0.04822	0.6022	9.84025
0.2188	9.33995	2 5/8	94-32-12	1.12312	0.05043	0.6807	9.83295
0.2200	9.34242	.....	94-59-53	1.12444	0.05094	0.6782	9.83135
0.2240	9.35017	2 11/16	96-29-13	1.12885	0.05264	0.6703	9.82624
0.2265	9.35516	.....	97-30-00	1.13168	0.05372	0.6650	9.82284
0.2292	9.36015	2 3/4	98-30-05	1.13466	0.05487	0.6600	9.81953
0.2300	9.36173	.....	98-48-35	1.13557	0.05521	0.6585	9.81854
0.2344	9.36991	2 13/16	100-28-08	1.14061	0.05714	0.6505	9.81323
0.2396	9.37946	2 7/8	102-24-54	1.14667	0.05944	0.6415	9.80720
0.2400	9.38021	.....	102-33-50	1.14714	0.05962	0.6408	9.80675
0.2448	9.38880	2 15/16	104-20-44	1.15284	0.06177	0.6330	9.80142
0.2465	9.39195	.....	105-00-00	1.15621	0.06304	0.6302	9.79950
0.2500	9.39794	3	106-15-36	1.15912	0.06413	0.6250	9.79588
0.2600	9.41497	.....	109-53-51	1.17150	0.06874	0.6108	9.78588
0.2604	9.41567	3 1/8	110-04-25	1.17200	0.06893	0.6101	9.78541
0.2673	9.42693	.....	112-30-00	1.18072	0.07215	0.6013	9.77912
0.2700	9.43136	.....	113-28-34	1.18429	0.07346	0.5980	9.77667
0.2708	9.43270	3 1/4	113-45-36	1.18533	0.07384	0.5970	9.77597
0.2800	9.44716	.....	117-25-40	1.19746	0.07826	0.5851	9.76722
0.2813	9.44909	3 3/8	117-26-54	1.19920	0.07889	0.5850	9.76717
0.2821	9.45041	.....	120-00-00	1.20027	0.07928	0.5774	9.76144
0.2900	9.46240	.....	120-30-04	1.21102	0.08315	0.5759	9.76035
0.2917	9.46489	3 1/2	121-02-15	1.21336	0.08399	0.5744	9.75919
0.3000	9.47712	.....	123-51-18	1.22495	0.08812	0.5667	9.75333
0.3100	9.49136	.....	127-08-33	1.23926	0.09316	0.5584	9.74691
0.3109	9.49265	.....	127-30-00	1.24059	0.09363	0.5575	9.74624
0.3125	9.49485	3 3/4	128-01-18	1.24289	0.09443	0.5563	9.74527
0.3200	9.50515	.....	130-28-37	1.25391	0.09827	0.5506	9.74086
0.3300	9.51851	.....	134-19-16	1.26892	0.10343	0.5425	9.73443
0.3333	9.52288	4	134-45-44	1.27395	0.10515	0.5417	9.73373
0.3341	9.52386	.....	135-00-00	1.27517	0.10557	0.5412	9.73335
0.3400	9.53148	.....	136-51-46	1.28428	0.10866	0.5377	9.73050
0.3500	9.54407	.....	139-58-05	1.29997	0.11393	0.5321	9.72603
0.3541	9.54921	4 1/4	141-13-56	1.30650	0.11611	0.5301	9.72431
0.3600	9.55630	.....	142-14-08	1.31599	0.11925	0.5284	9.72299

TESTING STEEL PLATE WELDS

Methods for Quickly Determining the General Character of the Work

A paper on testing welds and dealing with the welding of steel plates by the oxy-acetylene and metal electrode processes was discussed by S. W. Miller, Rochester Welding Works, Rochester, N. Y., before the September meeting of the Chicago section of the American Welding Society, 608 South Dearborn Street, Chicago. The paper was supplemented by 28 photomicrographs of characteristic good and bad welds. Mr. Miller said in part:

The method of test to be applied in any given case depends largely on the use to which the welded piece is to be put. If it is to be used in a pressure vessel, I believe that not only should a tensile test be made but that an alternating stress test should be used because of the breathing of the tank due to changes of pressure. This latter test should also be applied where the weld is subjected to bending strain. There are no standards at present for weld tests but it is advisable, whenever possible, to follow those of the American Society for Testing Materials.

Inasmuch as a welded piece is not of uniform character, it is not possible to use the elongation and reduction of area as commonly measured. Where the break occurs in the weld, the elongation of the whole test piece tells very little about the quality of the weld and I have been in the habit of taking the elongation in each inch, two inches, etc., of the gage length beginning at the center inch which includes the weld, and plotting these figures against the gage length. Evidently, when the break is outside the weld, the various physical characteristics are those of the original material and not at all of the weld.

The best test, in my opinion, to determine quickly the general character of a weld, is to grind it off level with the surface of the pieces and clamp it on an anvil, with the center of the weld level with the top of the anvil, the bottom of the V toward the anvil so that the top of the weld is stretched when the projecting end is struck with a sledge. The blow should not be too heavy and the number of blows and angle to which the piece bends before cracking are quite a good index of the value of the weld. In the case of defective welds, that is, those not fused along the V or which contain slag or other inclusions, this test will at once develop the defects.

If a welded piece were to be used in a place where it might become red hot such as, for instance, in a locomotive fire box crown sheet, it would be proper to test the weld at a good red heat.

There seems to be quite a definite relation between the thickness of metal, the size of tip and the size of the welding wire, in the case of gas welding, and between the thickness of metal, the diameter of the electrode, and the current used, in electric welding. It is also to be understood that electric welds, except possibly those made with covered electrodes, will not stand as much bending as oxy-acetylene welds.

Testing for Hidden Defects

In many cases, the defects in welds are easily visible to the naked eye when tested. In other cases, they are not, and while it would seem plausible that the visible ones were more dangerous, yet to my mind the hidden danger due to the ones that are hard to see is a matter that must not be overlooked. For many years the dangerous defects in steel rails have been those which were not visible, and which have been very small at the start.

There has recently been developed a method for testing rails for these hidden defects which has been devised by A. M. Waring. It consists of deeply etching a polished surface of the material under test. For instance, a section of a weld might be cut out with a hack saw, machined or filed to a true surface, and polished on various grades of emery paper, ending up with 00 Manning. It is then placed in a warm solution of 25 per cent hydrochloric acid and water for from a half an hour to an hour. The acid will eat away the defects, making the edges of the material at them taper, so that rather large grooves and pits will be visible where the defects prior to the etching would be only microscopic. It is not really necessary to warm the acid, although it takes longer when it is cold.

The bending test hot and cold, and the etching test, I consider to be of the greatest value in ordinary shop practice where it is desired to find out rapidly and quite accurately the quality of the work done by the different welders.

Some of the defects in welds are visible under the microscope but others are not visible until the weld is strained. A small bending machine that can be placed on the microscope stage is very useful, because after etching the piece can be bent and examined to see the effect of the strain.

A pamphlet on "Electric Furnace Alloy and Special Carbon Steels," as made in basic Heroult electric furnaces, has been issued by the United Alloy Steel Corporation, Canton, Ohio. After discussing electric steel, it gives data regarding the company's products including charts of the properties of its chrome-nickel-molybdenum and chrome-nickel steels. It is also well illustrated.

The McKeesport, Pa., plant of the Columbiana Foundry Co., of which F. C. Sullivan, formerly vice-president and chief engineer of the Braddock Mfg. Co., Braddock, Pa., is president, is almost completed and will start operations on Nov. 15. This company specializes in small and light section gray iron castings running from 2 oz. to 250 lb.

Continuous Milling Machine

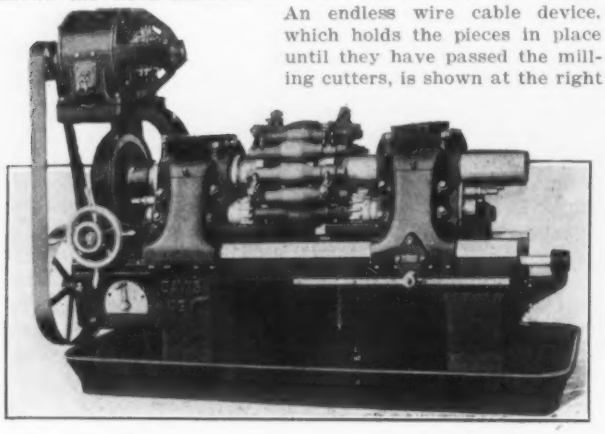
A new machine designed for continuously milling forgings, such as camshafts, crankshafts, automobile axles and other forgings requiring milling to length, has been placed on the market. It can also be used for milling small castings, such as sad-irons, tractor and automobile parts. The machine is designated No. 1 milling machine, and is manufactured and marketed by the Davis & Thompson Co., 251 Reed Street, Milwaukee.

In each of the gear housings of the machine, shown in the accompanying illustrations, is two cutter spindles which have a micrometer adjustment endwise of 2 in. A locking arrangement holds the spindles in place. The spindles have opposed cone bearings.

Of the two heads the right-hand head is adjustable on the bed, like the tail stock on a lathe, and is clamped to the ways of the machine. This permits milling to length various sizes up to the capacity of the machine. A single pulley drive and two changes of speed are provided.

The work mandrel is supported in each of the gear heads, or spindle housings, and is rotated by a bronze worm wheel and hardened steel worm. The different feeds are provided by change gears located at the back of the machine, and the feed is engaged by cone friction. The lower gear housing, which incloses the speed gears, is an oil-tight compartment, and is filled with transmission oil, which insures lubrication to all bearings and gears, while the lubrication is taken care of in the gear heads, or spindle housings, by a large oil reservoir inside of the housing, the gears running in a bath of oil.

The Milling Machine Has Two Heads, of Which the Right-Hand One Is Adjustable on the Bed. The illustration below shows the work fastened to the work mandrel by clamps. An endless wire cable device, which holds the pieces in place until they have passed the milling cutters, is shown at the right



The machine is made to take any desired length between the cutters. The fixtures, which are in halves, clamped and keyed to the work mandrel, can be easily removed. A set of fixtures is made to take each individual class of work.

In some cases a set of clamps is supplied, one clamp holding down two shafts as shown in the illustration of the machine arranged for milling worm shafts, while in many cases an automatic clamping apparatus for holding round work, small castings, etc., is furnished. This is an endless wire cable device, having two or more cables. The cable is kept taut by a large tension spring at the back of the machine. With this arrangement the production is large, as all the operator has to do is to drop the pieces in the notched jigs and pick them up as they come around after being milled. The pieces pass underneath the cable as the table rotates, bringing the work in contact with and past the cutters. The machine has a roughing and finishing cutter which permits the use of a heavy feed, as the finishing cutter will give a satisfactory finish even with a coarse feed.

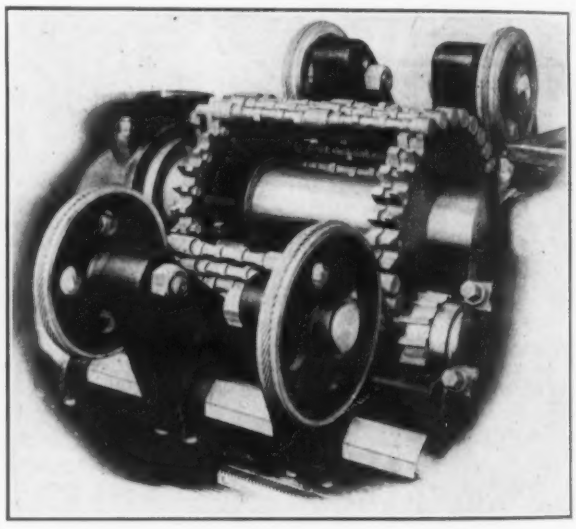
It is stated that as yet no cases have been encountered where an operator could insert the parts faster than they could be milled. When milling castings with the cable arrangement it is sometimes necessary to make a jaw-receptacle for holding castings in place to insure a good path for the travel of the cable, and to prevent acute bends in the cable. The cables move possibly 20 in. per min.

In milling camshafts with the rope clamping arrangement, the average output is about 350 per hr., depending upon the operator's ability to place them, while if the camshafts are held in place by bolts and clamps, like the worm shafts shown, the production is 100 per hr., or less. It is explained that the operator cannot clamp more than 100 pieces in an hour, a performance which requires him to tighten 100 nuts, place 100 clamps, loosen 100 nuts, and take off 100 clamps.

The rope clamping attachment can be easily removed from the machine to allow the milling of other work, held in place with bolts and clamps.

Decrease in Coke-Oven Accidents

Statistics gathered from reports furnished by operators of coke ovens to the Bureau of Mines, Washington, show a gratifying decrease in the number of men killed and injured during the year ended Dec. 31, 1919, as compared with the previous calendar year. Figures published by the bureau in technical paper 226 show that the number of men killed in 1919 was 73, while the number injured was 4031 in 1919 and 7792 in 1918. The total number of men reported employed in 1919 was 28,741; during the previous year it was 32,389. The fatality rate in 1919 (based upon the number of 300-day workers) was 1.92 per 1000 men employed; in 1918 it was 2.06. The non-fatal injury rate in 1919 was



145.66 per 1000 300-day workers as compared with 219.64 for the year 1918.

The report is based upon returns representing 46,902 beehive ovens and 8545 by-product ovens. The average number of days the ovens were operated was 289. This operating time is equivalent to 8,302,059 man-days, or about 22 per cent less than in 1918.

The accident and labor figures in the report are probably not complete for the entire industry in the United States, but are sufficiently representative to indicate the principal causes of accidents and the frequency with which such accidents occur.

For the first time in the history of the coke-manufacturing industry in the United States the number of men employed at by-product ovens exceeded the number employed at beehive ovens. During 1919, the by-product ovens gave employment to 15,408 men as against 13,333 men at beehive ovens. The former also were in operation an average of 328 days during the year, while the latter were operated 244 days.

The war-time annual capacity of the forging department of the Creusot Works of Schneider & Co., France, is stated in the *Engineer*, London, England, to have been 20,000 tons of guns, 15,000 tons of sheets, 8500 tons of other forgings and 3500 tons of stampings, or a total of 48,000 tons of forgings. Had the war been continued, there were in process of rapid completion guns that would have outranked "Big Berthas."

New Cyanide Process for Hardening Steel*

Articles Independently Heated Out of Contact with Fused Cyanide Salt—Principles Involved and Other Methods Discussed

BY WILLIAM J. MERTIN

IRON and low carbon steels absorb carbon from so-called carburizers very readily when in contact with these carbonaceous materials at temperatures above the upper critical point (A-C-3).

The quantity of carbon absorbed depends upon—

1. The temperature or degree of heat above the A-C-3 point of the steel, or in other words, the higher the temperatures the faster and deeper the penetration of the carbon. This temperature is high enough to change the iron to gamma iron, which is capable of forming a solid solution with carbon or cementite.

Beta and alpha iron do not absorb carbon to an appreciable amount.

2. The character of the carburizer is a very important factor in the successful conductance of case-hardening, including the depth of the case. Elementary carbon as such is only of secondary importance. Oxygen and nitrogen compounds which are added or are naturally present in the so-called energizers, which form carbonaceous compounds with solid carbon, are necessary to generate nascent gaseous carburizing mixtures of carbon monoxide and cyanogen gas (CO and CN). Flourishing industries are built up on the production of these carburizing materials and energizers.

3. The percentage of carbon present in the steel used for case-hardening has also a marked influence upon the affinity of the material for more carbon up to saturation; more specifically a low carbon steel absorbs faster than high carbon steels.

4. The presence of chromium, tungsten, or manganese accelerates the absorption of carbon, since they form double carbides with the iron.

Nickel and silicon, however, retard the absorption. The fact that they form solid solutions with iron may be the cause for this retardation.

From the statement under paragraph 2, which emphasizes the necessity of nascent carbonaceous gas formation for penetration and absorption of carbon, it is readily conceivable that, if a properly heated piece of steel be brought into contact with pure nascent gas continuously generated in a separate unit or chamber and preferably under pressure, the conditions for case penetration would approach the ideal.

A process of this type is the one presented in this paper, but before giving the description, a survey of the processes now in vogue with their disadvantages and deficiencies seems to be appropriate.

Present-day Methods of Case-hardening

The most general and commonly used method of case-hardening is conducted by packing steel parts in a metal box filled with carburizing materials and firing the tightly closed box and contents at a sufficiently high temperature for an adequate length of time to give the desired depth of case.

This process is quite simple and assures a fair success if properly conducted in accordance with a prescribed procedure, experimentally determined to give certain definite results under definite and specific conditions. The disadvantages of this process are:

1. Uncertainty or proper reaction within closed box.
2. Difficulty in duplication of results as predetermined, because of non-uniformity of carburizers.
3. Long time exposure of the steel to a heat not well controllable, producing a questionable structural condition.
4. High cost of operation because of inefficiency of the heating method. Cost of boxes and rapid deterioration of same by oxidation or scaling.

A second method is case-hardening by immersing the steel article in a cyanide bath heated to about 860 deg. C. (1580 deg. Fahr.).

This process is convenient and effective on small articles only and where depth required is not more than 0.005 in. to 0.015 in., or where mere surface hardening is wanted. This is a fast case-forming method and from ten to fifteen minutes gives the desired depth.

The outstanding disadvantage of this process is that no uniform case can be produced. The parts deep in the melted bath do not get the same depth of penetration as the parts near the surface. The evolution of the cyanide gases at or near the surface favors the penetration and it is hardly feasible to have pots with a large enough surface area to take care of the case-hardening of a plant.

The third method consists of dipping a cherry red piece of steel or tool into a container of powdered cyanide salt, such as potassium cyanide, sodium cyanide, ferro- and ferricyanides, or sprinkling the powdered salt of these cyanides on the red hot steel surface and putting the steel back into the fire again. The case-hardening produced in this way is but a very superficial one and resistance to excessive wear cannot be expected.

In the fourth method the carburizing gases are passed over a piece of steel heated in a retort. This process is applicable to parts that are intricate in design.

All these processes serve the needs of the different industries more or less satisfactorily. Box case-hardening is, at best, dirty, wasteful and unsatisfactory in a number of instances. Case cyaniding by firing in fused cyanide salt is inefficient, unreliable, dangerous and costly.

Retort case-hardening with carbonaceous gases is a step in the right direction, but it leaves something to be desired on account of the selection of the carbonaceous gases and the method of application.

The process to be discussed next, although still in the experimental stage, owing to radical changes in the principle employed, appears to present opportunities for efficiency, preservation of the product, simplicity of operation, assurance of uniformity and duplication of results, speed of operation, reasonable cost, and wide range of utility. We may call this process a regenerated cyanogen gas case-hardening.

It has long been recognized that the most efficient carburizing gas is cyanogen (CN), that the case is of a greater uniformity, is more rapidly produced and penetrates deeper than one produced by carbon monoxide (CO), but the highly poisonous character of the substance has been a serious objection to its use and the tendency is to wastefully lead the gas to the stack and out of harm's way, instead of controlling it to get maximum efficiency.

To case-harden steel and iron alloy articles in a stream of cyanogen gas evolved from a container filled with an alkali cyanide salt, heated by electrical energy or other means to accomplish vaporization or boiling of the salt, is the principle upon which this process is based.

The articles or materials to be processed are independently heated out of contact with the fused cyanide salt. The advantage of this will readily be appreciated on recalling the statements made regarding the fact that case-hardening is produced by contact with gaseous and not with solid carbon and more especially with cyanogen gas. It is obvious why I claim this to be the only correct manner of case-hardening. The depth

*A paper presented at a joint meeting of the Pittsburgh chapter of the American Steel Treaters' and Heat Treating Research societies, at Pittsburgh, Sept. 9. The author is metallurgical engineer Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

of penetration is then only a function of the uniformity of the temperature of the article treated and the duration of treatment.

Nascent cyanogen gas has a speed of penetration four or five times greater than that of carbon monoxide.

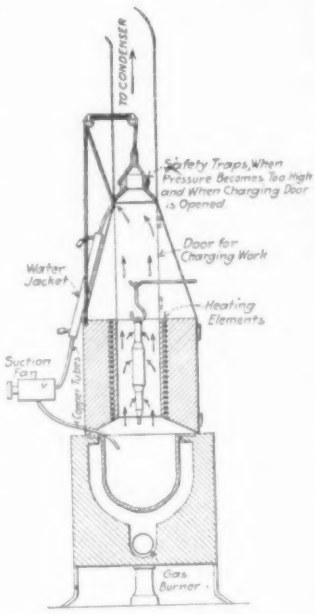
The furnace shown in the accompanying sketch embodies the regenerative principle since the excess gases not absorbed by the steel are forced under pressure into the fused cyanide bath, are reheated, causing a vigorous stirring of the bath, and a lively evolution of cyanogen gas, leaving with more energy and larger quantities, therefore more vigorously attacking the steel surface, causing accelerated and deeper penetration.

This regenerative type of furnace is a means to use the rather expensive salt economically, as the nitrogen gas on returning will combine with the sodium and a carbon supply in some cheap form such as charcoal can be added to the liquid as required, thereby retaining the original supply of cyanide salt intact.

It is therefore obvious that this process may compete successfully with the present box or packing carburizing processes.

To prevent the poisonous gases which are under pressure, "as you recall," from escaping into the room the suction fan is shut down before the charging door is opened; a bell ventilating device for inducing draft is arranged to open the bell when the fan stops and prior to opening the door.

The parts of the pump or suction fan wherever possible should be of non-ferrous metals such as copper basic alloys or hard copper. Water cooling jackets or other protective methods are to be employed for return flues for hot gases, and nozzle end of flue must be hard copper, monel metal or other non-ferrous alloy with a high melting point.



Regenerative Cyanogen Gas Case Hardening Furnace

Speed of pump or blower is to be regulated so as to cause the desired degree of circulation.

Sodium cyanide melts at 600 deg. C. (1112 deg. Fahr.) and boils at 800 deg. C. (1472 deg. Fahr.). The temperature of the pot must therefore be not less than 800 deg. C. and to effectively absorb this gas the steel is at a temperature above A-C-3, or about 900 deg. C. (1650 deg. Fahr.).

The furnace illustrated in the sketch is a design for the processing of shafts, etc. A slight modification of the upper or steel heating chamber will adapt this furnace to a variety of work; grates of nichrome metal with a knife edge supporting the grate bars are employed in such case.

The advantages of this process are the following:

1. Temperature control is more perfect since pyrometer is inserted directly in heating chamber.
2. It gives a finer, more uniform and deeper case than any other process and requires less time, and is therefore cheaper.
3. It eliminates the use and storage of carburizers and carburizing boxes.

The efficiency of cyanogen gas for case-hardening has never been fully appreciated nor has it been fully obtained, since during previous tests the temperature was at or below the boiling point of sodium cyanogen (1465 deg. Fahr.), which is considerably below the A-C-3 point of the steel, but even in this unfavorable condition an exceptionally high speed of penetration has been noted by different writers on this subject.

It should be noted that while some of the less important features of this process are still speculative in character, the method is based upon well known principles and the conclusions have been drawn from a careful study of general case-hardening practice.

Co-operative Methods for Preventing Foundry Accidents*

Committee System of Organization Should Include Employees—Five Committees Sufficient

BY R. A. SALISBURY†

THE attitude of the executive toward safety is reflected in the organization he perfects to prevent accidents, and the means by which safety education is disseminated. Dividing accident prevention work into, first, organization, meaning the formation of safety committees, second, education, including in this term every possible method of enlightening the employee on the value of safety, and third, safe-guarding, including mechanical devices and appliances, lighting and sanitation, it is at once clear organization is of prime importance. It is the center from which education and safe-guarding emanate.

As to the particular plan of organization, it may assume various forms; each safety engineer may have a favorite plan and it may be as varied as the conditions are varied in the plants where it is to be applied.

What general plan of organization should be designed to carry on the accident prevention work in a foundry divided into a wheel and soft shop where there are from one thousand to twelve hundred men employed? That is the special topic to which I will give my attention in this paper. The ideal method of organization must include employee, as well as officer and the various units of such organization must have highly specialized functions. There must also be co-operation between the various units and one of such units must stand in the position of a court of review to which any disputed matter may be appealed for final decision. The unit of the safety organization (as it is indeed the unit of all social organization for whatever purpose it may exist) is the committee. The number of committees may be larger or small, but my own view is that five committees in the foundry are sufficient to carry on the work. Too many units are necessarily cumbersome and may result in overlapping of activities. The five committees, each of which we will briefly discuss may be conveniently designated as the plant committee, foremen's committee, workmen's committee, accident investigation committee and a special chain and cable committee.

Five Necessary Committees

The manager or general superintendent of the shop should act as chairman of the plant committee, which ought to include the general foreman, master mechanic, the chief engineer, local auditor and safety engineer. The latter should act as secretary and hold himself responsible for the general functioning of the committee.

This unit ought to meet whenever a special occasion demands it, and regularly at least once a month. It should pass upon all suggestions or recommendations which may have been appealed to it from other committees and discuss such suggestions as may have come from individual employees or from the other commit-

*Paper read at meeting of National Safety Council at Milwaukee, Sept. 29.

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tees, with a view to ascertaining whether they are feasible or practicable. This committee shall arbitrate and finally pass upon all matters submitted to it, and shall formulate all rules, regulations and specifications. It must also supervise all matters pertaining to safety education, special report forms and service work.

The foremen's committee, as the name indicates, must include in its membership the foreman in the shop. Their meetings should be semi-monthly. At these meetings, special attention should be given to the discussion of accidents which have occurred in the shop with a special view to reaching clear-cut conclusions as to their cause. Of equal importance to ascertain the cause of accidents is the discussion of ways and means to prevent their recurrence and this, of course, is the most important work of the foremen's committee. This committee should also have read to it comparative accident reports. The safety engineer should make it his duty frequently to examine the members of the committee on general safety rules and such an examination should be conducted at least once a month. Inspection tours of the shop should be frequently made by the members of the foremen's committee. The safety engineer should prepare a simple set of by-laws and see to it that all the members of the committee abide by the simple rules and regulations contained in such by-laws. Carelessness or negligence in attending the meetings should be discouraged and the absence from a meeting duly called by the safety engineer should be noted in the minutes of the meeting and a written excuse required from the member who is derelict.

Workmen's Committee

This committee is composed of representatives of the workmen of the plant. Such representatives may either be chosen by the foreman over each department or by the foreman in conjunction with the workmen. In a plant of the size we are now discussing there should be seven representative molders, four cupola men, two brake wheel workmen, two core room employees, one wheel pit worker, two yardmen, three chipping wheel employees, three shop laborers, one teamster, two machine shop men, one pattern shop employee, one representative of the electricians and two miscellaneous employees. The committee, of course, will have among its representatives both day and shift workers. The day workers should serve on the committee two months and the shift men three calendar months in order to obviate changing the entire personnel of the committee at one time. This committee ought to meet semi-monthly upon due notice given by the safety engineer who should also act as chairman. The safety engineer should see to it that all current accidents are fully discussed and that suggestions for the prevention of similar occurrences have the fullest consideration by the members of the committee. In many respects, this is the most important unit of the organization, and the safety engineer will find that before this committee he will have the best opportunity of disseminating ideas of safety.

The more stereotyped safety rules will result by reason of the changing membership of the committee, in educating all of the employees in the shop. It goes without saying that these meetings should be held on the company's time.

Accident Investigation Committee

This unit must have for its membership the best intelligence in the office. The master mechanic should act as chairman and there should serve with him the chief electrician, carpenter shop foreman and safety engineer. The committee should inspect all the circumstances surrounding the accident in a thorough and impartial manner, with the idea of ascertaining the immediate as well as remote causes for the accident. Forms promulgated by the safety engineer should be used by this committeee in making reports of accidents. The safety engineer should see to it that these reports are complete in detail, bearing in mind that it may be necessary to submit such reports to the law department in case of a controversy between the employer and the employee. In its sittings this committee should be careful not to rely upon hearsay and rumor as to the circumstances surrounding the accident, but should call before it the actual eye-witnesses and obtain from them the desired information.

The master mechanic shall appoint two riggers to act on the chain and cable committee, meets at least once a week. These men should be instructed to make a thorough survey of the plant with a particular view to inspecting chains, cables, hooks, ropes and blocks and tackle. It should be their duty to report their findings on the condition of the equipment to the safety department at once. In case a piece of equipment is found to be dangerously defective this committee should have authority to immediately tag it "out of order."

Accident Records

In speaking to safety men there is no need to stress the importance of accident records. The safety department should be able to justify its existence by referring the doubter to records and statistics. Records of all accidents, of course, must be retained. In classifying accidents, causes are unquestionably of paramount importance to the safety engineer. These should engage his best attention and furnish him constantly with new ideas of accident prevention. The effort put forth by a safety engineer in the mental process of generalizing from the recorded causes of accidents will abundantly repay him. Records should also be classified as to time lost.

The initial step in the preparation of records is the foremen's report of the accident; this may be made on a stereotyped form in such a manner that a mere glance will inform the examiner of the date of the accident, a brief description thereof, and the nature of the work in which the employee was engaged at the exact moment of the accident, and his experience at the work in which he was engaged at the time of the accident. The records will necessarily include a technical report by the surgical department and from all of these the engineer must decide upon the nature and extent of the investigation that will be required. The engineer must by all means compile at regular intervals reports of accidents calculated to clearly indicate their cause and these reports should be posted on all bulletin boards and furnish the themes of the discussion at safety meetings. The records must also show cost of accidents both to the employer and employee. The safety department must make cost reports showing the monthly expense and disbursements of the department and at the same time indicate the increase or decrease from the corresponding period of the previous year or years. The reports should suggest reasons for the increase or diminution of the expenses of the department. It is unnecessary to state the cost, and the expense of the safety department should be classified in hospital fees, medical and surgical expense, salaries, amounts paid in settling claims, amounts paid on pending claims and estimates to be paid.

Bulletin Boards

Bulletin boards of sufficient number to care for the material sent from the National Safety Council should be well placed. In addition to the ordinary bulletin boards, we have placed at each of the main gates a large board 15 x 20 ft., portraying a page of a calendar. Each accident resulting in disability of seven or more days' duration is indicated on this board by a red line drawn through the numerals; fatalities by a blue line. On this board space is provided for striking phrases and pointed sentences which are frequently changed. Interest in this board must be stimulated by interrogation of workmen picked at random from the plant. On these occasions the employee is examined as to his recollection of the material facts appearing on this board and at the same time inquiries can be made as to whether he possesses goggles and a rule book. In each case he should be encouraged in suggesting means of accident prevention. We have found that this method of personal examination brings gratifying results.

Much can be made of danger and caution signs, of moving picture exhibitions and of systems of awards or bonuses for favorable accident records but a discussion of these would lead too far afield.

STEEL PLANTS OF AFRICA

Report on Present Condition of the Industry and Estimate of Requirements

WASHINGTON, Oct. 18.—Vice-Consul Charles J. Pisar has sent to the Bureau of Foreign and Domestic Commerce a report by the Government mining engineer of the Union of South Africa on the present condition of the iron and steel industry in that dominion. According to this report, there are now five iron smelting companies in operation there and a sixth is to commence in October, 1920. The total value of the iron and steel goods produced in South Africa in 1919 was £405,798 ($1,974,816 at normal exchange). According to the Government engineer's report, the Union Steel Corporation's works, at Vereeniging, Transvaal, had a successful year in 1919, the production being 10,318 tons of open-hearth steel from scrap or pig, the value of the output being £200,753 ($976,964). The newly installed 3½-ton Heroult electric furnace had 10 months' work, and produced 1,394.5 tons of steel of the total value of £30,485 ($148,355). Most of this output goes to the mines in the form of shoes, dies, rails, and tube-mill bars. The corporation is now arranging to forge shoes and dies after casting by means of a 600-ton hydraulic press.

The Transvaal Blast Furnace Co., in which the Union Steel Corporation is largely interested, was not working continuously, but produced 676 tons of pig iron of the value of £2855 ($13,894).

Blast Furnaces Relighted

The blast furnace of the Pretoria Iron Works, at Pretoria, Transvaal, was restarted in March after a stoppage due to the influenza epidemic and certain necessary alterations to the plant. It was blown out early in September, as its working interfered with the erection of the large and modern equipped foundry which was then being taken in hand. During the six months' run of the furnace it was conclusively proved that the ores and fluxes were as good as could be desired. The quality of the iron varied from time to time, but practically all the iron produced during the run is salable. The output of pig iron was 1286 tons, of the value of £9645 ($46,937). It is the intention to increase the capital and to work on a much larger scale, and to produce not only pig iron but also steel in the form of angles, bars, tees, beams, rails, sleepers, etc.

At the Dunswart Iron & Steel Works, Dunswart, Transvaal, little alteration has taken place during 1919. During the latter part of the year an 8-in. rolling mill was installed, and the average monthly output increased to about 550 tons of bar, rod and angle iron. The total output was 5596 tons, of the value of £139,660.

At the Witwatersrand Co-operative Smelting Works the original electric furnace was re-erected in a fresh position so as to be more conveniently operated in conjunction with the new one. A new preheating furnace was also built, suitable for providing hot scraps for either furnace. Ferromanganese, ferrosilicon and ferrochrome being obtainable, a higher quality of steel has been produced. The life of the liners has been increased owing to more experience in operating, as much as 75 tons net of castings being obtained from one liner. The total output of shoes and dies was 1043 tons, of the value of £22,400 ($109,010).

The Newcastle Iron & Steel Co., Ltd., is erecting a plant at Newcastle (Natal) to produce pig iron from ore, open-hearth steel, and iron and steel castings up to 20 tons weight. This company expects to start mining ore in July and smelting in October, 1920.

Pretoria Iron Works

The Pretoria Iron Works at Pretoria, after considerable experimentation, is satisfied that it can produce a high-quality pig iron from the iron ore resources at its command. In May of the current year it reorganized its business under the name of the South African Iron & Steel Corporation (Ltd.), with an authorized capital of £1,500,000 ($7,299,750), in order to undertake the smelting of ore and the manufacture of steel on an economical basis. It is the intention of the company to erect blast furnaces with an aggregate daily capacity of 200 tons. Later on the output is to be increased to 500 tons a day.

"The Union Government," says Vice-Consul Pisar's report, "has been anxious to see the development of the iron and steel industry in South Africa. To assist this industry, it entered into a 17-year contract last January with the Pretoria Iron Works, by which it binds the Railway Administration (the railways in South Africa are Government owned) during that period to purchase from the Pretoria Iron Works 50 per cent of its requirements in rails and similar material at a price which shall not exceed the landed cost of articles of similar quality imported from abroad. The administration is guaranteed one-third of any profits made by the iron company in excess of 10 per cent. The company, under a guaranty of £5000, undertakes to fulfill its agreement and to use South African materials in preference to imported goods.

"This agreement between the Government and the Pretoria Iron Works was ratified by the Union Legislature in August, 1920. In connection with the above undertaking, it may be stated that the estimated annual requirements of iron and steel in the Union of South Africa include 77,000 tons of rails for the railways and mines; 5000 tons of angles and channels; 21,000 tons of bar, bolt and rod iron; 8000 tons of plate and sheet iron; 2500 tons of bolts, nuts and washers; 25,000 tons of fencing standard; 6000 tons of drill steel; 7500 tons of steel shoes and dies; 2500 tons of steel castings, and 10,000 tons of pig iron, constituting a total of 165,000 tons. The railway requirements constitute a large percentage of these amounts."

Effect of Depth of Copper Plating on Carburization

Tests to discover the effective depth of copper plating on carburization were described by F. P. Zimmerli, department of chemical engineering University of Michigan, Ann Arbor, Mich., in the October issue of the journal of the American Society of Mechanical Engineers, 29 West Thirty-ninth Street, New York. The object of the test was to determine the least amount of copper which must be plated on a piece of steel in order that within a specified time no carbon shall have penetrated through the copper coating and gone into the steel.

The steel chosen for the experimental work was ¾-in. bar stock. This was cut longitudinally into half-round pieces approximately 0.75 in. x 1.25 in. on the flat side. The flat sides, approximately 0.94 sq. in. in area, were ground smooth and true on an emery wheel. These uniformly smooth surfaces were cleaned and the backs greased preparatory to plating.

The current density advised for plating is 0.003 ampere per sq. cm. and the copper deposited at 20 deg. C. 2.3716 grams per ampere-hour. Because of gas evolution and deposition of copper on the backs of the pieces which no grease would seem entirely to keep off it could not be figured beforehand just how much copper would plate on, nor could the current be kept constant at 0.003 ampere per sq. cm. for each set. An effort was made, however, to keep to this value. The plating used on the specimens was from 0.00000896 in. to 0.001815 in. thick.

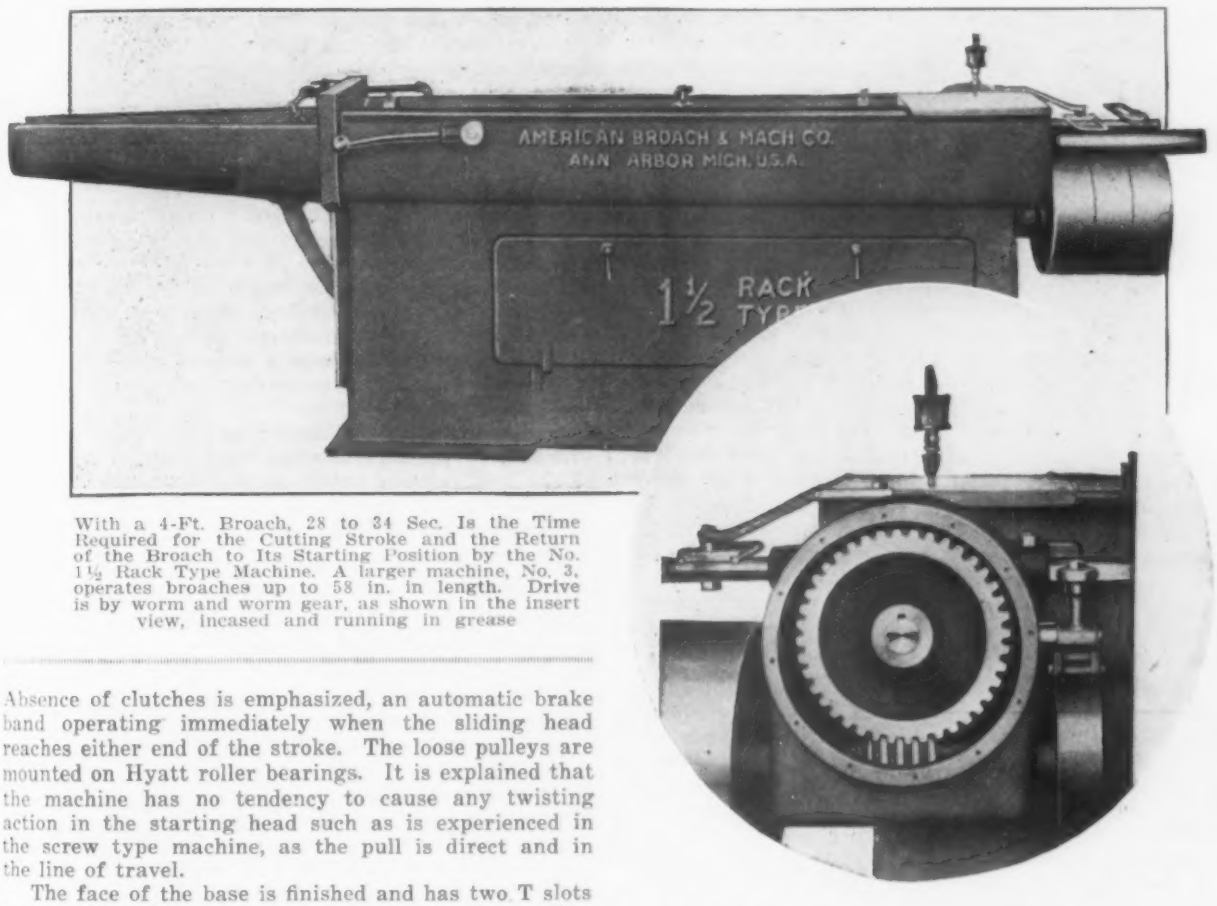
Several 2½-in. iron pipes 8 in. long with caps were obtained and a small hole drilled in each, thus keeping the pressure atmospheric. The test pieces were packed in them with the carburizing mixture and were treated at 1697 ± 3 deg. Fahr. in a large gas furnace for 1, 2, 4, 8 and 12 hr. respectively.

The experiments, Mr. Zimmerli stated, would tend to show that in copper plating with a current of as low density as the one employed, there is no need of using as deep a plating as is now common practice, also the depth of copper plating required for ordinary work is not over 0.0002 in., or with a 100 per cent safety factor, 0.0004 in., and very often a less thickness would be sufficient.

Rack Type Broaching Machine

A rack type broaching machine for which more rapid operation is claimed than for the company's screw operated type of machine is a recent product of the American Broach & Machine Co., Ann Harbor, Mich. With a broach 4 ft. long, 28 to 34 sec. is given as the time required for the cutting stroke and the return of the broach to its starting position. The reverse is twice the speed of the cutting stroke. Automatic stops, adjustable for different lengths of stroke, are provided.

Drive is by worm and worm gear, shown in the accompanying illustration, incased and running in grease. The main drive pinion engages a D-shaped rack.



With a 4-Ft. Broach, 28 to 34 Sec. Is the Time Required for the Cutting Stroke and the Return of the Broach to Its Starting Position by the No. 1½ Rack Type Machine. A larger machine, No. 3, operates broaches up to 58 in. in length. Drive is by worm and worm gear, as shown in the insert view, incased and running in grease

Absence of clutches is emphasized, an automatic brake band operating immediately when the sliding head reaches either end of the stroke. The loose pulleys are mounted on Hyatt roller bearings. It is explained that the machine has no tendency to cause any twisting action in the starting head such as is experienced in the screw type machine, as the pull is direct and in the line of travel.

The face of the base is finished and has two T slots for attaching boring fixtures, an oil trough or other attachments. Shelves are provided in the cabinet base, and an oil pump and detachable oil trough are also furnished.

The machine illustrated is the No. 1½ size. A larger machine, No. 3, is suitable for operating broaches up to 58 in. in length, with a capacity of broaching up to 3½ in., spline or square holes.

Exports of Engines

WASHINGTON, Nov. 9.—Out of exports of gasoline traction engines from the United States during September, about half went to Canada. The exports of gasoline traction engines during the month totaled 2299, valued at $2,118,965. Those sent to Canada totaled 1453, valued at $1,079,570.

Steam traction engines exported during September totaled 103, valued at $90,053. Forty-nine of these, valued at $17,158, went to Canada, while 40, valued at $52,240, went to Mexico.

Kerosene traction engines exported in September totaled 1171, valued at $861,022. Of these 661, valued at $643,508, were shipped to Canada.

Preparing for Winter Demands

Independent producers in the Mahoning Valley are planning to fortify their operations as carefully as possible by storing a large tonnage of coal this winter. Several plants have established special coal storage facilities to obviate the dependence upon day-to-day shipments. With close of navigation on the Great Lakes, a heavy movement of coal into the Valleys is anticipated.

Ore piles still need replenishing in some cases and the carriers will continue ore shipments as long as weather permits. Severe weather last winter resulted in cutting down the tonnage of ore in furnace stock yards to a point that caused alarm. With open weather, the railroads should be able to further build up stocks at the furnace and reduce dock balances.

Practically all of the ore shipped to Valley furnaces from Ashtabula Harbor, Ohio, is via the Franklin division of the New York Central Railroad. In October this division broke all records for car handling, moving 84,094 loaded and empty cars, an increase of 54 per cent over the corresponding movement in October, 1919.

Federation of Open Shop Associations Proposed

Steps are being taken to form a national federation of open shop employers' associations under the initiative of the Associated Employers of Indianapolis, through A. J. Allen, secretary, 1406 Merchants Bank Building. Questionnaires have been mailed to various associations asking whether such a federation is approved and what plants of organization are thought best. A convention is proposed on or before Dec. 1 for launching the undertaking. Each association is expected to send not less than five delegates, all men of prominence in their community.

Quoting the planners of the movement in regard to the president for such a federation, "it has been suggested that the president should be a man of national prominence in the business world, whose attitude of fairness in the handling of industrial affairs generally is beyond question and who has escaped the taint of bias and prejudice, in order that the labor unions cannot justly misrepresent and attack the federation on this score."

The advantages pointed out for such a federation are the interchange of ideas, counsel and advice obtainable and the concerted action possible in questions of large scope.

INCH VERSUS MILLIMETER

British Company Decides for a Single, Not a Dual, System of Measurement

H. F. Hemmings, manager of the Willans works of the English Electric Co., Ltd., Rugby, England, writing in *Machinery* for October, gives the following concerning the decision of his company against retaining the metric system of measurement:

"In reading the article in the August number of *Machinery* relative to the experience of the De Laval Separator Co., Poughkeepsie, N. Y., the most important point that strikes one is that the De Laval Separator Co. manufactures a specialty under a condition approximating mass production. Many years ago the Willans works in Rugby were entirely engaged in the manufacture of a specialty—the Willans central valve engine—and at that time adopted the metric system in the engineering and manufacturing departments. The conditions governing the nature of their product have long since changed and they are now engaged in the manufacture of general engineering products.

"As a result, the question as to the advisability of retaining the metric system has had to be considered and a committee of those responsible for production in this company have given the question of English versus metric measurements as applied to the various works of the English Electric Co., Ltd., full consideration. In considering this matter the committee had before them at the time a summary of the report of the Committee on Commercial and Industrial Policy after the War, which committee reported against the use of the metric system. The committee of the English Electric Co. issued a report on the use of the metric system at the various works within the combination, which are five in number. After full consideration the situation was summarized as follows:

"1. All public committees whose composition and standing make their reports worthy of consideration have decided against the metric system as a practical proposition for manufacturers in this country.

"2. It is not possible to use the metric system in this country to the exclusion of the inch system. Even at Rugby, where a determined effort has been made to make the metric system a commercial success, it has been found quite impossible to eliminate the inch; consequently both systems exist side by side and a double stock of precision and other tools has to be carried at considerable expense. Our experience at Preston and Stafford is the same.

"3. There are therefore two alternatives to choose from, either (a) the inch system by itself, or (b) a dual system consisting of inch and millimeter.

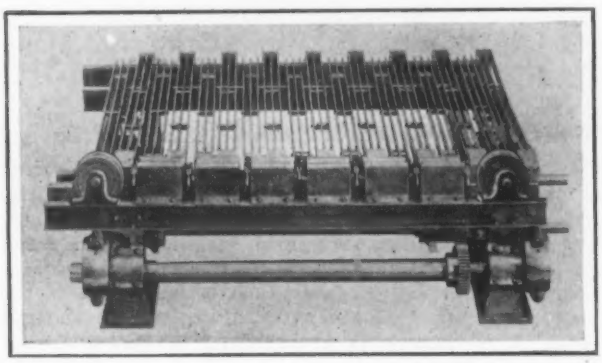
"4. The question arises whether each works can settle the question for itself or whether a uniform system of measurements should be used by all works within the combine. Since the matter is almost entirely one of works production and in view of the importance of interchangeable manufacture, it would appear a matter of prime importance to use the same system of measurement in all works.

"5. While the designer might prefer to retain the millimeter, the shops without doubt prefer the inch. The question before the committee, therefore, is: Can we get back to the inch as a unit of measurement or is it better to retain the present dual system of millimeter and inch?

"It was considered that it was not a commercial or practical proposition to work with both systems, and of the two systems the committee was of the opinion that the English was the preferable one, so far as the products of the various works of this company were concerned."

Mechanical Hot Bed

A new mechanical hot bed has been brought out by Arthur G. McKee & Co., Cleveland, for which simplicity and adaptability in the handling of diversified products is claimed. The hot bed, a section of which is shown in the accompanying illustration, is composed of alternately stationary and movable sets of bars. A set of eccentrics imparts to the movable bars a slow vertical motion, moving these bars alternately above and below the level of the stationary bars. A second set of eccentrics is engaged or disengaged at will, and when engaged imparts to the movable bars a slow horizontal motion so that the resultant motion is elliptical; thus the product is lifted from, advanced and deposited on the stationary bars, or the motion may be reversed to back up the product, if desired. When the second set of eccentrics is disengaged the product moves slowly up and down without advancing.



Section of McKee Mechanically Operated Hot Bed, Composed of Alternately Stationary and Movable Sets of Bars. Cams impart a horizontal and vertical motion to the bars so that the resultant motion is elliptical, thus to lift and advance the product

A throw-out can be provided that will edge and pack the material such as alloy springs when an annealing effect is desired, and in fact any flats may be handled in this way which will reduce scaling, and at the same time keep the pieces straight. The mechanical motions of the bed are electrically controlled by an operator stationed at any convenient position.

A hot bed of this construction, it is explained, gives maximum capacity in a given width for the reason that the material to be cooled can be packed or spaced at any desired interval. It will straighten product that can be packed and the supports are close together to prevent the material from sagging between the supports.

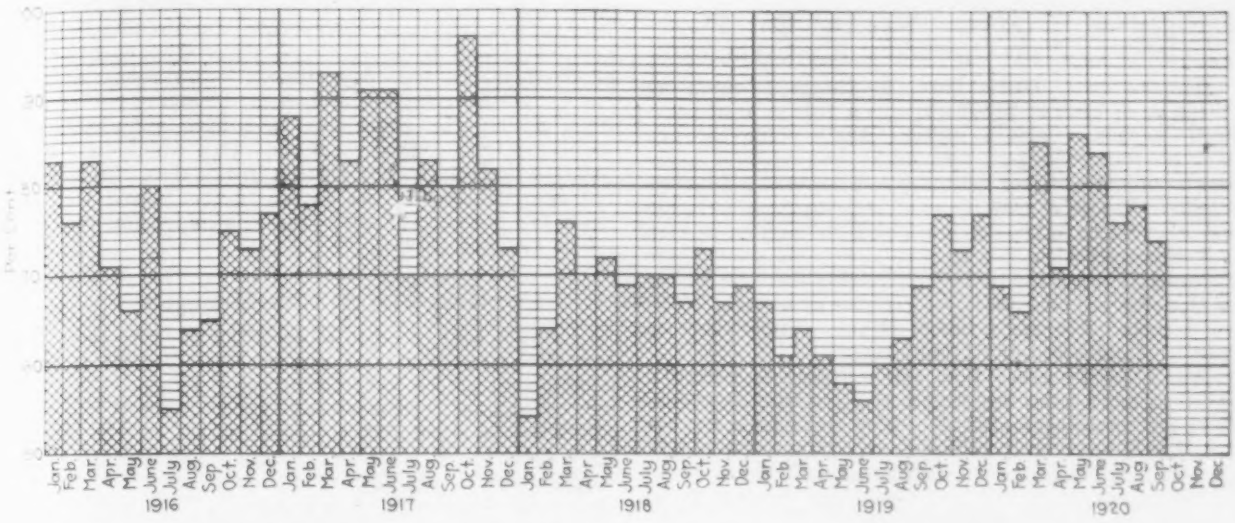
The wearing parts are removed from the heat zone, and heating of the supports is minimized due to the material's being in contact with one set of supports only a few seconds at a time. Where merchant product or sections of moderate weight are to be handled, the bed is built "heel proof," that is, with the bars close enough together so that operators can walk on the bed and can in any emergency use it as a stationary hand operated hot bed. The same principle is used in constructing hot beds for heavy products but the supporting members are made heavier and are spaced somewhat further apart.

Booklet on Electric Furnaces

The Acheson Graphite Co., Niagara Falls, N. Y., has issued a valuable booklet entitled "Electric Furnaces" which gives general information regarding each type of steel and non-ferrous furnace made in the United States and Canada, as well as the Baily and Haskins heat-treating furnaces. Illustrations of each furnace are also provided. Some information of a similar nature about steel furnaces made in the United Kingdom and Continental Europe is also provided in Section II.

The Mexican import duty on iron piping exceeding 15 centimeters inside diameter has been removed, according to a telegram from Trade Commissioner Noll at Mexico City. The duty on piping of this measurement has been above 1c. United States currency per kilo of 2.2 lb.

Shipments of Malleable Castings, 1916 to October, 1920



The above chart of the American Malleable Castings Association shows shipments of castings and the relation which they bear to the capacity of the manufacturers whose figures are accessible to the association. Shipments for July, August and September, as represented by the shaded areas on the chart, are well above the average rate of shipment during the period of heaviest demand for castings in 1918 and 1919. During the entire war period, the complete stoppage of immigration was the cause of a labor shortage, which has been felt with special force in the foundry business, because of dependence on immigrant labor.

The improvement in the average rate of shipment during 1920 can be attributed entirely to the reduced demand for men in other occupations, but it is only within the last 60 or 90 days that it has been possible for the malleable industry to make any headway at all in shipments as compared with the tonnage of unfilled orders, and if the unemployment in other lines continues, it may reasonably be expected that the malleable industry will be able to reduce the tonnage of such orders very materially, operating more nearly up to capacity, and giving customers better deliveries than have been possible since 1915.

Largest Month's Freight Movement in History

"Statistics compiled by the Bureau of Railway Economics disclose the fact," say the *Railway Age*, "that in August the railroads moved more freight than in any previous month in any year in history. This seems a conclusive answer to charges made by W. G. McAdoo and others that the railroads have been inefficiently operated since they were returned to private control, and that they can be operated with maximum efficiency only under unified Government control. The number of tons of freight moved one mile in August was 42,706,000,000. The nearest approach to this ever made before was in August, 1918, when the number of tons moved one mile was 40,776,000,000. The average miles each freight car was moved daily in August was 27.4. This was the greatest mileage ever attained in any month except in May, June and July, 1917, under private operation. In other words, in none of the 26 months of Government operation was this record for car movement ever equaled. The average tons handled in each loaded car in August, 1920, was 29.8, a record exceeded only in the months of July, August and September, 1918, when shippers for patriotic reasons were giving the railroads the highest degree of co-operation.

"The best test of the efficiency with which the country's freight cars as a whole are being utilized is the average number of tons of freight moved one mile daily with each car. The average number of tons moved one mile daily with each car in August, 1920, was 526. This record has been surpassed only in August and September, 1918, when the average load per car was the highest ever reached, and in June, 1917, under private operation, when the average miles per car per day was almost the highest ever reached. The average number of tons moved one mile daily with each car in August, 1918, was 534; in September, 1918, 535; and in June, 1917, 542.

"The amount of freight moved in October undoubtedly will be found, when all the statistics are available, to have surpassed even that in August. In the week ending Oct. 9 the number of cars loaded was 1,009,787, while in the week ending Oct. 16 it was 1,005,000. The number of carloads moved in each of these weeks surpassed that handled in any week in August."

Going Through Readjustment Period Successfully

WASHINGTON, Nov. 9.—"We are over the top and on the down grade in most phases of industrial and commercial life," says a monthly report on business conditions issued by Archer Wall Douglas, chairman of the committee on statistics of the Chamber of Commerce of the United States. "There still continue to be exceptions to this general statement. Finished lines of metals, drugs and automobile sundries are among the most notable exceptions, especially as to price changes, which are few as yet in these particular branches of business.

"Demand in all lines is slackening. It is everywhere a case of most conservative buying rather than any great increase in supply. Manufacturing and mining are meeting the situation in the usual fashion by running on reduced time or shutting down altogether. This has already meant in some cases reduced wages.

"Talk of stabilizing prices so as to save the situation no longer interests any one save a few hopeless theorists. The laws of supply and demand will in time regulate matters. The entire business world is steadily trending to that readjustment which we have talked about so long. We have been through it before several times, and we will go through it again, and successfully."

The Harrisburg Mfg. & Boiler Co., Harrisburg, Pa., has completed negotiations for taking over the business and assets of the Hurlburt Motor Truck Co., New York, manufacturer of the Hurlburt trucks. The Harrisburg company had been engaged for more than a year in the manufacture of parts for the trucks, but by the recent deal it becomes sole manufacturer and distributor.

INCREASING EFFICIENCY

Youngstown Employers Weeding Out Incompetents as Plant Operations Are Curtailed

YOUNGSTOWN, OHIO, Nov. 9.—Sagging operating schedules of district producers are a reflection of backward buying. Certain makers again went through their plants in the past two weeks and adopted measures to promote higher efficiency and to weed out incompetents. Forces of electricians, machinists, millwrights and laborers have been reduced and the number of men to certain operations has been cut. For instance, where it formerly required four millwrights in one Valley plant, three are now employed for the same work. While the volume of unemployment is still small, there is growing intermittency of employment.

All interests agree that the industry is facing a period of more quiet business, which is expected to continue for several months. A Valley sheet maker is reported to have recently suffered cancellation of a 14,000-ton order of black sheets. This order will likely be replaced, however, as soon as consumers are convinced that the market has reached bottom.

Two additional blast furnaces have been suspended and a third is scheduled to go out at an early date. No. 2 stack of the Youngstown Sheet & Tube Co. in the Hubbard group is down for repairs and relining, though it would not have been suspended had it not been for an accident, as the company needs the metal for steelmaking. The Valley Mould & Iron Corporation has suspended one of its furnaces at Sharpsville, Pa., owing to trade conditions. Mary furnace of the Sharon Steel Hoop Co., Sharon, Pa., located at Lowellville, Ohio, will be banked shortly and will be idle until the first of the year.

Valley makers started the week with lowered schedules and consequently reduced output. The Republic Iron & Steel Co. is on a 70 per cent operating basis. Only three of six open-hearth furnaces of the Sharon Steel Hoop Co. at Lowellville are in commission. Trumbull Steel Co. has 30 of its 44 sheet and tin mills at its Warren plant engaged in tin plate production, with orders in sufficient volume to maintain this schedule for the remainder of the year. Its strip and sheet business is less active. Four of the six blast furnaces at the Ohio Works of the Carnegie Steel Co. are pouring, with operations in the rolling mills proportionate. The slack is attributed to coke shortage. The Struthers Furnace Co., Cleveland, is operating its furnace at Struthers, Mahoning county, on a reduced scale because of fuel difficulties.

South Works Starts Vocational Course

The Good Fellow Club of the Illinois Steel Co., South Chicago, Ill., has expanded its activities beyond the social sphere to include vocational education. Mr. Bost, an employee of the company, has been appointed vocational educator and will direct the work of conducting classes in subjects which will promote the interests of the men. Among the subjects which have been called for are shop mathematics and arithmetic, English, chemistry, music, machine shop practice, auto mechanics, blacksmithing, carpenter work, cabinet making, physics, mechanical drawings, masonry, metallurgy and blast furnace practice. All instruction will be by company men. The instruction will be given free to all employees interested and in such a way as will not interfere with their other duties. Classes so far organized include apprenticeship groups consisting of 33 men in the machine shop, seven in the foundry and pattern shop and 35 in the electrical repair shop. These men are now doing excellent work in shop mathematics and mechanical drawing in addition to their training in shop and mill work. There are 12 men meeting once each week for study and discussion of blast furnace practices. Four groups of men are taking up instruction in citizenship and English. These are assembling at the noon hour from 12 to 12:30 at the No. 1 open-hearth plant, the duplex plant, blast furnaces 5 to 10, and the machine shop.

Reading and consultation rooms have been supplied with magazines selected by the men and their foremen. These may be read by any of the men who are off duty. These places will also serve later as stations where men may receive individual instruction. Such reading rooms are to be found in the electrical repair shop, cast houses of the blast furnace department, locker rooms of the No. 1 open-hearth plant and in the blooming and structural mills. The employees have been supplied with vocational guidance data cards, upon which they can indicate their desire for certain instruction. Following the classification of the cards, further plans will be made for individual instruction and additional reading rooms provided.

Unemployment in Michigan

DETROIT, Nov. 8.—Statistics gathered from the various Michigan industrial centers with regard to unemployment give a very encouraging view of the matter. While in Detroit unemployment a week ago was estimated at about 65,000, the situation has improved since then, and it must be remembered that normal unemployment in the city ranges from 15,000 to 35,000 according to the time of the year. At least 15,000 of the total may be considered as "floaters." Bay City plants are running at about 70 per cent of normal, as are those of Saginaw and Lansing. Flint and Battle Creek plants are running at about 80 per cent of normal, while in Kalamazoo the lay-off is very small. Grand Rapids plants are running between 60 and 70 per cent of normal, with Muskegon at 50 per cent and Jackson 48 per cent. Plants at Owosso are running at about 60 per cent of normal.

Peace in the Chicago Building Trades

Peace in the Chicago building industries that will put an end to jurisdictional strikes among unions is pledged in an agreement which has been signed by officials of the labor organizations interested. The agreement was reached after two weeks of negotiations, and pledges the union men to arbitrate all disputes between now and May 1, 1921. It was also promised that no request for higher wages will be made until the expiration of present contracts.

The action of the unions is expected to act as a stimulus to building in Chicago, which has been at a low ebb ever since the strike of 1919. Of interest in this connection is the latest report of building permits, namely, that covering the month of October. Permits were taken out for 246 buildings, fronting 8510 ft. and involving $3,538,150, as against 291 structures, fronting 9439 ft. and involving $3,970,000 in September. It is hoped that the action of the unions will result in turning the trend of building upward.

Praised Representation Plan

Following an inspection of the Steelton, Pa., plant of the Bethlehem Steel Co. last Thursday, President Eugene G. Grace and other Bethlehem officials attended a banquet in the evening to mark the installation of new employees' representatives. President Grace and other officials praised the employees' representative system in bringing about co-operation between the employees and the management. Included among the speakers, in addition to President Grace, were Frank A. Robbins, Jr., general manager of the Steelton plant; Quincy Bent, vice-president in charge of operations; J. M. Larkin, assistant to President Grace, and others. Uriah Brown, chairman of the employees' system, acted as toastmaster. More than 100 employees' representatives attended.

Riveters at Fore River Works Strike

A strike of some 500 riveters at the Fore River Works, Bethlehem Ship Building Corporation, Quincy, Mass., has necessitated the laying off of 1000 other shipbuilding craftsmen at that plant. There is a possibility of the plant closing unless labor conditions there improve. The company has enough business on its books to keep it operating at capacity for three to four years.

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ESTABLISHED 1855

THE IRON AGE

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The Strike of Buyers

Until the public believes that labor costs as well as material costs have been sharply cut, the present strike of buyers is likely to continue. In the partial resumption now in progress at plants which have been idle, workers are being hired at lower scales, and where wages are unchanged there is larger output per dollar paid; but not until there is increased idleness and generally lower labor costs seem certain is any broad buying movement to be expected.

Deep cuts, as in automobiles, were followed by only short-lived buying, since the public is not assured that a further recession might not occur with lower labor costs. The buyer doubts that the reductions thus far offered in various lines are likely to cut deeply into profits after readjustments are made in the costs of materials entering into the product. He feels that the manufacturers hoped to keep producing, that therefore labor would suffer little readjustment and consequently prices were merely at a temporary level. Now he silently asks labor to reduce the margin above the gradually receding living cost and plainly expects the manufacturer to reduce the percentage of profit to that of pre-war days, if indeed he does not look for him to produce at a loss for a time. Large numbers appreciate that sometimes business must be taken at any cost to help meet overhead charges and maintain an organization.

Complaint has been made by automobile and other interests that iron and steel prices have not receded very much, but it has been forgotten that the United States Steel Corporation, which has so fully supplied the hesitant steel consuming industries, has not raised its prices since March, 1919, when they represented a $12 per ton cut from the fixed prices of the war period. Probably not much more than one-third of the finished steel sold in the last twenty months was bought at higher than Steel Corporation prices, seeing that premium prices were not a factor until the steel strike.

The daily press has now discovered the increases in unemployment and progress has been made by this fact toward the return to normal business. The more drastic the curtailment, harsh as that process may seem, the sooner will come the desired change in buying sentiment.

The Violation of Contracts

In all times of declining prices, orders are canceled to a greater or less extent and condemnation of the practice is always heard. An illustration of this fact was furnished a few days ago by Oliver M. Fisher, a shoe manufacturer of Newton, Mass. Following his election as president of the Boston Boot and Shoe Club, he issued a statement in which he painted a sad picture of the almost complete paralysis of the textile and shoe manufacturing industries of New England; not, as he said, because textiles and shoes were not needed, but because the covenants entered into, the contracts made, had been torn and broken without regard for their legal value, without any regard for the financial loss entailed upon the manufacturers. Mr. Fisher strongly condemned the cancellation policy and appealed for a higher standard in business.

"From my own business experience," he said, "there is nothing on earth that business needs so much to-day as religion. By that I mean responsibility to God, to man and to the obligations that go with it, in order that our relations with each other shall be the relations of one brother to another. Obligations must be kept and the covenants we made must be considered sacred and binding." Mr. Fisher expressed his solemn conviction that Christianity is the heart of the covenant of all business life.

This is sound preaching, but we believe that what the business world needs to-day in addition to such preaching is to show in as detailed and as practical a way as possible how it can be applied. That there is often much to be said in defense of the man who asks for the cancellation of a contract, is shown in a letter which THE IRON AGE has

received from one of its readers, who writes as follows:

The suggestion contained in a recent market paragraph in THE IRON AGE on sheets "that vigorous action might be necessary to make those (the automobile) interests take the tonnages they had bought," suggests a question as to the extent the manufacturers will go in their efforts to make the buyers live up to their obligations. "Vigorous," if it means legal action, probably will be resorted to in but few cases, for while the contract which is employed by the National Association of Sheet and Tin Plate Manufacturers provides for penalties in the failure of the manufacturer to ship the specified tonnage within the specified period or the buyer to specify, too many extenuating circumstances exist in the present situation for strict adherence to contractual obligations on either side. The automobile manufacturers, it may be argued, should have curtailed production when labor, fuel and transportation conditions restricted and retarded the production of steel, instead of offering premium prices for what they required and had to have to maintain their schedules. But it may also be asked if those who accepted the premium business, often at the expense of contract obligations, now the bone of contention, are not to bear some of the burden. Cancellations are impossible under a strict observance of the sheet contract, but revisions of prices are not without precedent. When price reductions were made as of Jan. 1, 1919, and again on March 21, 1919, first in conformity to the suggestion at the conference between the representatives of the iron and steel industry and the then expiring War Industries Board and again when the iron and steel industry met with the Industrial Board, existing sheet contracts were revised in price to the recommended levels. A revision of existing contracts could be made without serious loss to manufacturers, or old contracts could be "married" to new ones to mutual satisfaction. Legal actions are distasteful to manufacturers and hardly are likely, at least by those sheet manufacturers the bulk of whose business comes from the automobile industry.

The conditions described by our correspondent show that the application of the ideal to the practical is not always easy, and probably a jury of men of high character would not easily agree as to exactly where the fault lay in the cancellations of orders for steel sheets above described. There is no parallel to the interrupted production of steel in the past twelve months, from strikes, fuel scarcity and transportation break-down. Unable to get the steel they had bought, many consumers went to other sources and paid high prices. When their original purchase was tendered them they did not need all of it and in some cases not any of it.

Mr. Fisher seems to think that cancellations since the war have been such as would not have been tolerated before the war. He had in mind particularly conditions in the textile and shoe manufacturing industries, of which it is to be said that never in their history has there been such a widespread and determined strike of the ultimate buyer against the prices asked by retailers. In the iron and steel industries conditions as to contracts are now no worse than they were in certain periods of depression in ante-bellum days. Many cancellations have been coming in and more will be received, but in recent years distinct progress has been made in securing contract observance. This is due partly to an increasing number of business men insisting upon the sacredness of contracts, and partly to the fact that as a rule contracting is for shorter periods than was customary years ago.

Without even seeming to apologize for any violation of contracts, it must be said that the picture is not as black as it is sometimes painted, for those who have asked to have contracts modified, particularly after failing to receive steel when needed, often have had much to justify them, and sentiment against arbitrary violation of contracts is stronger than ever before. While there will be many cancellations and extensions, there will be a largely increased number of buyers who will rigidly adhere to their obligations even though that means financial loss.

Prospective Coke Prices

In the general price readjustment in iron and steel the matter of coke prices is a very important item. Of the three raw materials in pig-iron making, limestone is a relatively minor item and does not fluctuate widely in cost. Ore prices change only from year to year and the changes from one season to another are usually not great. Coke, on the other hand, has had a wide range and has fluctuated rapidly, hence the furnaceman must watch coke more closely than anything else.

It is not surprising, therefore, that although pig iron cannot find its eventual and stable level for some time still, furnacemen are already canvassing the coke situation in the hope of getting some light on probable cost. Of all cokes the price of Connellsville is easily the most important, even though the merchant output of that region takes care of a much smaller percentage of the total pig-iron production than it did a few years ago.

The theory has some support in certain quarters that the market price of Connellsville furnace coke will be in some predetermined ratio to the market price of basic pig iron at valley furnaces, a ratio of 4 to 1 being frequently mentioned. On this basis, should basic pig iron find a level at $32, valley, coke would be worth about $8, while if pig iron should settle at $28 the coke price would be about $7.

The theory can hardly be defended adequately by reference to the elements that go to make up market prices. For instance, the view is strong in the minds of buyers and sellers of coke that the ratio should vary somewhat according to the general level of prices, whereby the ratio would swing in favor of coke if prices generally are high, and against coke if prices in general are low. Before the war some coke contracts definitely recognized this principle, the ratio varying slightly according to pig-iron prices. Incidentally, the ratio of 4 to 1 finds no precedent before the war, when commonly the market showed 7 to 1, 6 to 1 and 5½ to 1.

A more popular viewpoint as to the future of the coke market is that the price will be made in relation to the market price of coal. In coal the prospect is that the future will be marked more

by periods of scarcity than of overproduction. In coke the condition is that there is more coking capacity than consuming capacity, by reason of so many by-product ovens having been built in recent years. When coke is scarce there is always a condition of coal being scarce or of transportation being inadequate, and if the railroads cannot haul all the coke it is desired to move it is altogether improbable that they can furnish full service in moving coal.

With many Connellsville operations coal and coke are practically interchangeable. The operator can ship coal or coke as he chooses. It is a detail that some coking operations are not provided with coal shipping facilities. If a more or less permanent situation should be presented favoring the shipping of coal the facilities readily could be installed.

On the theory just mentioned a formula for the prospective market price of coke is constructed, one and one-half times the market value of coal plus about a dollar for conversion, so that a coal price of $4 would suggest a coke price of about $7 and a coal price of $4.50 a coke price of about $7.75.

The Connellsville coke operators have no particular reason, on the basis of this theory, for fearing the competition of by-product ovens. When coal is scarce the by-product ovens will be indisposed to offer coke at closely competitive prices, while when coal is plentiful the cost of coal to by-product ovens will probably be materially higher than the open market price of coal, so that the beehive operator would find it advantageous to make coke.

The unprecedented and serious condition confronting the British steel industry, both domestic and foreign, is further emphasized by the export statistics for September, recently made public. They show not only a further decline in exports but a marked increase in imports. The September steel exports of 256,280 gross tons are next to the lowest of the year, even lower than those of August, and 136,700 tons less than in July, the peak of the year. They compare with 420,000 tons per month in 1913. Imports in September reached 173,838 tons, the largest for the year and only 22,000 tons less than the pre-war rate of 195,264 tons per month in 1913. The conclusion is that foreign competition is preventing the expansion of British foreign steel trade and even competing with domestic business. The London *Iron and Coal Trades Review*, in discussing the "trade depression in the iron and steel industry," cites the following causes: Incessant scramble for higher wages, coupled with shorter working hours; the Government's policy of taxation, and foreign competition. From Belgium and Luxemburg twice as much in wrought iron bars and shapes and blooms and billets was imported in September as in August. Shipments of semi-finished steel and steel plates from the United States constituted the large proportion of the British imports in September and for the first nine months of this year. The same journal says that "there appears to be only one course open by which business can be revived and unemployment checked. Prices are far too high and must be considerably reduced before we can effectively trade either in our own markets or abroad." The coal strike has made this recovery still more difficult and prolonged. Co-operation between employers and employed, as well as interchange of confidences, is the cure in Great Britain as well as elsewhere.

Railroad Buying

For many years before the war there was frequent criticism of the conduct of the railroads in the matter of making purchases for permanent improvements, particularly purchases involving the use of steel. The purchases, it was pointed out, were usually made when steel prices were relatively high. "Why," it was asked, "do not the railroads buy when steel is cheap, and when the steel mills need the orders? Few investments are of more permanent character, and it is certain that the traffic demands upon the railroads will increase." The answer, of course, was that the railroad policy had to be, or at least was, dictated by financial conditions, and it generally chanced that it was easier for railroads to borrow money when business was good than when business was in the doldrums and steel mills were idle.

The epoch-making legislation of last February has changed this situation entirely. The public guarantees that railroad earnings shall be fair, sets the rate at 5½ or 6 per cent to March 1, 1922, and leaves it to the Interstate Commerce Commission to determine afterwards from time to time what rate is a fair one. In times when business is dull capital is not scarce, but rather is plentiful. It avoids uncertain investments and seeks high class bonds. In such times the railroads should be able to borrow money quite readily, and with the principle established that the public desires railroad facilities to be ample, railroad expenditures are likely to be approved by the commission. When, in the judgment of the commission, prices are high expenditures will not be encouraged.

If matters work out as they should, in conformity with the spirit and letter of the Transportation Act, the railroads are likely to be in future a stabilizing rather than a disturbing element in the steel market. The iron and steel producers will have a backlog of railroad business that will help them when the hand-to-mouth consumers are quiescent.

In the past few weeks it has been no secret that some large car orders were ready for placing, being held up chiefly on the matter of price. There has been no great objection to the cost of the steel to be used or to the margin of profit desired by the car builders or assemblers, but there has been serious objection to the price set upon many of the parts or appliances the car builders must purchase. There is no doubt that when the time comes that prices can be considered moderately low, rather liberal orders for cars will be placed. The same condition will apply, in a measure, to rails. There is more or less flexibility in the quantity of rails that should be laid from year

to year. When rails can be bought at relatively low prices, and when labor is readily available for doing the work, the renewals should be particularly heavy. In a year when steel and labor are scarce the renewals should be kept down to a minimum. Under the operation of the Transportation Act these economic principles seem likely to prevail in actual practice.

The American manganese industry has grown in the last nine months to proportions nearly equal to those attained during the war. This is a surprise. Data on other pages show that the production of ferromanganese to Oct. 1, 1920, averaged 23,369 gross tons per month against 28,775 tons per month in 1918, with the available supplies, counting imports, 27,650 tons per month to Oct. 1, against 30,741 tons per month in 1918. The records of this year have never been surpassed except in 1918. Another feature is the supply of manganese ore. The imports to Oct. 1, this year, have averaged 47,001 tons per month, against the previous high record of 52,498 tons per month in 1918. These figures assure ample supplies for domestic needs and make it possible to export appreciable quantities. Thus far foreign demand has been insignificant. With the British export price at £45, or $153 per ton at present exchange, producers in this country should be able to do some business, the American domestic price ranging from $155 to $170, seaboard. British ferromanganese supplies much of the steel industry of the world outside of the United States.

BELGIAN STEEL INDUSTRY

No Improvement With 8-Hour Day—Increased Coal Output—Decreasing Business

BRUSSELS, BELGIUM, Oct. 25.—Delay by the Belgian senate in ratifying the law establishing the 8-hr. day throughout industry has provided considerable propaganda for syndicalists and other radical agitators. The senate contends that before action is taken in a matter that will have such a revolutionary influence on Belgian economic conditions, it should be studied and considered from every angle. One senator declared that several plants in Belgium which had introduced the 8-hr. day following the decision of the industrial conference at Washington claim to be satisfied but say that production is not improved. He expresses doubt that the law would prove good in view of Belgium's position as an exporting country and the necessity of competing with other nations in foreign markets, particularly at present. A socialist senator contended that legislation of the kind is imperative to reduce the mortality and sickness that is prevalent among workers with the hands.

In a report read before the General Assembly, the Forges et Laminoirs de Jemappes has stated that work in their plants was resumed in August, 1919, on the 10-hr. day basis, because of the daily loss of about four working hours at change of shifts. After the Industrial conference at Washington, at the request of the workmen the 8-hr. day was instituted with three shifts. The company expressed its satisfaction at the quality and quantity of the work under the shorter day but said that it had found necessary to increase prices slightly as production had remained proportionately the same.

Automobile Depression

The depression in the automobile industry in other countries is beginning to be felt in Belgium, where the sale of a large number of surplus army automobiles of both the Belgian and foreign armies had flooded the market. The increased price of gasoline, which is now about 2 francs per litre (about 8 fr. per gal.) has forced many owners of cars to dispose of them. There has also been an influx of cheap foreign cars of British, German and American manufacture. Companies with normal sales of 20 cars a week are reported to have dropped to about 2 cars a week. Both France and Belgium have absorbed numerous sales of army cars, not only from their own countries but from Britain and America.

Belgian Export Situation

While the first eight months of 1920 saw considerable exportation of Belgium material to England for re-export, Belgian producers claim that since August sales of all kinds of semi-finished material to this market have been exceedingly light. Exporters are evincing interest in the project of the Cuban government to construct a $1,000,000 pier at Havana. The work is in charge of the Cuban minister of public works.

Excepting in mills which foresaw the present depression in trade and booked heavy export tonnage when buyers were willing to place orders, books are not well filled. Foreign buyers in Brussels at present have evidently satisfied their needs elsewhere. Evidently the first effects of Belgian and German competition for foreign markets is being felt. German representatives in South America have surprised both Belgian and American bankers with their offers of early shipment and extended credits, which are extremely welcome owing to the slump in coffee, sugar, hides and other products of these markets, which prohibits these buyers from paying the higher British and American prices.

Large sizes of iron angles are now quoted at from 900 francs to 910 francs per metric ton which is also the base price on bars and rails. Sheets are quoted at about 1250 francs. There is a fairly heavy demand from South America for beams and channels, but on the whole trade from this source is light. Recent sales of rails to Egypt totaled about 3500 tons, with about 2000 tons to Spain and 11,000 tons to Holland.

Improved Coal Production

Belgian railroads have shown improvement in transportation recently and the tonnage of German indemnity coal moved has been surprisingly large. Exclusive of coke, 540,000 tons of coal were transported into Belgium during August. The fuel situation in both France and Belgium is growing easier, particularly in France where by next spring it is predicted that the scarcity of coal and coke will have improved sufficiently to cause a general drop in fuel prices. At Lens, which was almost completely crippled by the war, coal extraction has shown a favorable increase and at Anzin in September, 4600 tons was extracted against a normal production in September, 1913, of 11,500 tons.

The Iron Age and Its Readers

One of the important daily papers of the country took what we said in this space two weeks ago and made more of it than we did. We told how a copy of THE IRON AGE of Nov. 1, 1866, found its way to the editor's desk and we made some quotations from it. Inferentially it was expected that the prices of the readjustment period after the World War would be in the reader's mind for comparison with those following the Civil War, but it remained for the daily paper to make the direct statement. What is exhilarating is the evidence of the wide audience THE IRON AGE reaches.

The leading article in last week's issue discussed an unsolved problem in present-day manufacturing plants. This is the giving of intelligent attention to the numerous new technical devices brought to the purchasing agent's office. In the largest organizations the purchasing agent cannot personally receive the numerous salesmen who apply daily, but one company, as the article showed, has provided a new office which functions to the entire satisfaction of the purchasing department, the salesman and the shop.

Iron and Steel Markets

NEARING MARCH 21 PRICES

Some Independent Mills on a 50 Per Cent Operation

Cancellations Increasing—More Furnaces Blow Out as Pig Iron and Steel Tend Downward

Current steel trade activities have to do mainly with cancellations of orders, further restriction of output of pig iron and steel and continued efforts by manufacturing consumers to reduce inventories and contract obligations before the end of the year. There are few new orders and more and more reminders of the aftermaths of some well-remembered booms.

It develops that here and there an independent producer would accept some business at the Steel Corporation prices, but in the main diminishing demand is met by cutting down output and by such an orderly retreat from the higher price levels as will protect unfilled orders now on the books.

As has been the case for some weeks, Steel Corporation mills are running nearer to capacity than the average independent plant, the percentage being about 80 for the former and 50 to 60 for the latter.

The Steel Corporation's statement of unfilled orders on Oct. 31 (not published at this writing) is expected to show a falling off of several hundred thousand tons. The reduction would have been more but that two or three subsidiaries which move much of their product in open-top cars have added to their mill stocks.

Recent cancellations have not been limited to higher priced business nor to smaller buyers. Some Steel Corporation tonnage has been included, since the steel could not be used at any price, and several important buyers have sought to cancel in many directions.

Companies whose business is largely with motor car makers have slackened further. The turning point in the latter industry is not in sight, little response being made to the first price reductions.

Buyers have been able to get black sheets at 6c. and 4.75c has been done on blue annealed.

Several Standard Oil companies are lining up their pipe requirements for 1921. The Prairie Pipe Line Co. has placed the bulk of the 40,000 tons on which it has been figuring.

Some sales of large-sized hard steel bars rolled from shell steel have been made to the implement trade at 3c., as against 3.25c. recently maintained.

Bookings for 1921 rail requirements for Eastern roads have practically been completed, placed chiefly with the Steel Corporation and two independent rail makers and all subject to a price yet to be named. A relatively small tonnage booked a few weeks ago by one of the independent mills at $62.50 per gross ton points to the likely price of the independent makers. The Steel Corporation's rail price announcement is not expected before early December.

Whatever the scale of locomotive and car buying for 1921, all signs point to heavy rail renewals in view of severe track wear on many lines. Inquiries from the Southern Railway for 2500 box cars and from the Louisville & Nashville for 2000 hopper cars make a total of 10,500 cars under active negotiation.

Pig iron prices on resale tonnages still tend downward. The market is very irregular and probably still lower prices would have been named if there had been any assurance that business would have resulted, but owing to the general lack of interest on the part of buyers, sellers have not been encouraged to make concessions. The effort of Southern furnaces to hold the market at the $42 quotation which long prevailed has not been successful, so far as any sizable tonnage is concerned and $38 is regarded as the market made for resale iron, with reports of concessions below that price. The weakest spot seems to be at Buffalo where as low as $40.75 for No. 2 plain is reported. Basic in eastern Pennsylvania has been marked down $2. Furnace operators are hoping that the curtailment of production which has set in will prevent prices from receding to extremely low levels. The largest pig iron inquiry was for 4000 tons of foundry grades by a sanitary company.

In Ohio and western Pennsylvania six blast furnaces have gone out since Nov. 1. Several in eastern Pennsylvania are about to stop and November will be marked by further scattering curtailment. Coke is lower as furnaces go out, the week's decline of $1 bringing furnace coke to $8 and $8.50, against $18 in mid-October.

Cast-iron pipe shops have not reduced prices, but the difficulty of maintaining the present level is evident. New Orleans has placed an order for 8400 tons with the leading pipe company.

Quoting £1 under British makers, Belgium is attempting to sell pig iron at £11, delivered in Scotland. Though the coal strike has been called off, blast furnaces in England will not be started until next week. Belgian billets are offered at £14, while the British price is £18. In France galvanized sheets are £34 and in England £35.

Pittsburgh

PITTSBURGH, Nov. 9.

For a time recently there were expectations in some quarters that the bridging of the gap between independent and Steel Corporation prices would be helped through some upward revisions by the Corporation, but any such idea now appears to have given way definitely to a fear that the Corporation may not hold even to present prices on all products. Reduction of this spread, however, is proceeding rather slowly, due to the fact that diminishing demands are being met by a curtailment of operations and a disposition on the part of the independents to make something of a stand at a given level, if for no other reason than to give some protection to such unfilled orders as are on their books. It is also realized that the demand is of such limited proportions that very little business would develop from a cut in prices.

While all of the corporation subsidiaries are operating as fully as is physically possible, the average being around 80 per cent, the past week has seen a further decline in the activities of the independent companies, which are not averaging more than 50 per cent of

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At date, one week, one month, and one year previous

For Early Delivery

Pig Iron, Per Gross Ton:	Nov. 9, 1920	Nov. 1, 1920	Oct. 12, 1920	Nov. 11, 1919
No. 2X, Philadelphia‡	*$47.79*	$48.79	$53.51	$36.10
No. 2, Valley furnace†	*41.00*	42.00	47.00	32.00
No. 2, Southern, Cin'ti†	42.50	42.50	46.50	33.60
No. 2, Birmingham, Ala.†	38.00	38.00	42.00	30.00
No. 2 foundry, Chicago*	40.00	40.00	46.00	30.00
Basic, del'd, eastern Pa	44.46	44.46	51.26	31.00
Basic, Valley furnace	38.50	38.50	46.00	27.50
Bessemer, Pittsburgh	43.96	43.96	50.46	29.90
Malleable, Chicago*	40.50	40.50	46.50	30.50
Malleable, Valley	42.00	42.00	50.00	31.00
Gray forge, Pittsburgh	*41.96*	43.96	47.96	29.90
L. S. charcoal, Chicago	*53.50*	58.50	58.50	37.50
Ferromanganese, Atl. port	*150.00*	155.00	170.00	115.00
Rails, Billets, Etc., Per Gross Ton:				
Bess. rails, heavy at mill	$55.00	$55.00	$55.00	$45.00
O.-h. rails, heeavy, at mill	57.00	57.00	57.00	47.00
Bess. billets, Pittsburgh	*50.00*	55.00	55.00	42.00
O.-h. billets, Pittsburgh	*50.00*	55.00	55.00	42.00
O.-h. sheet bars, P'gh	*60.00*	62.50	62.50	45.00
Forging billets, base, P'gh.	*60.00*	65.00	70.00	57.00
O.-h. billets, Phila	60.74	60.74	60.74	47.50
Wire rods, Pittsburgh	70.00	70.00	75.00	55.00
Finished Iron and Steel,				
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Iron bars, Philadelphia	4.85	4.85	4.85	2.995
Iron bars, Pittsburgh	*4.50*	4.75	4.75	3.00
Iron bars, Chicago	3.75	3.75	3.75	2.72
Steel bars, Pittsburgh	3.00	3.00	3.25	2.75
Steel bars, New York	3.38	3.38	3.63	3.02
Tank plates, Pittsburgh	2.85	2.85	3.25	2.65
Tank plates, New York	3.38	3.38	3.63	2.92
Beams, etc., Pittsburgh	3.00	3.00	3.10	2.45
Beams, etc., New York	3.38	3.38	3.48	2.72
Skelp, grooved steel, P'gh.	3.25	3.25	3.25	2.45
Skelp, sheared steel, P'gh.	3.50	3.50	3.50	2.65
Steel hoops, Pittsburgh	*4.50*	5.00	5.00	3.25

*The average switching charge for delivery to foundries in the Chicago district is 70c. per ton.
†Silicon, 1.75 to 2.25. ‡Silicon, 2.25 to 2.75

Sheets, Nails and Wire,	Nov. 9, 1920	Nov. 1, 1920	Oct. 12, 1920	Nov. 11, 1919
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Sheets, black, No. 28, P'gh.	*6.00*	6.50	6.75	4.35
Sheets, galv., No. 28, P'gh.	*7.50*	7.75	8.25	5.70
Sheets, blue an'l'd, 9&10	*4.75*	4.90	5.00	3.55
Wire nails, Pittsburgh	4.25	4.25	4.25	3.50
Plain wire, Pittsburgh	3.75	3.75	3.75	3.10
Barbed wire, galv., P'gh.	4.45	4.45	4.45	4.25
Tin plate, 100-lb. box, Pgh.	*$7.50*	$8.50	$8.50	$7.00
Old Material, Per Gross Ton:				
Carwheels, Chicago	$33.00	$33.00	$36.00	$25.50
Carwheels, Philadelphia	39.00	39.00	41.00	28.00
Heavy steel scrap, P'gh.	*25.00*	26.00	28.00	22.00
Heavy steel scrap, Phila.	*20.00*	21.00	23.00	20.50
Heavy steel scrap, Ch'go.	*18.50*	19.50	22.00	18.00
No. 1 cast, Pittsburgh	*35.00*	38.00	40.00	27.00
No. 1 cast, Philadelphia	*36.00*	37.00	39.00	26.50
No. 1 cast, Ch'go (net ton)	*22.00*	26.00	29.00	25.50
No. 1 RR. wrot, Phila	*26.00*	27.00	31.00	28.00
No. 1 RR. wrot, Ch'go (net)	*16.50*	19.00	20.00	19.50
Coke, Connellsville,				
Per Net Ton at Oven:				
Furnace coke, prompt	*$8.00*	$9.00	$17.00	$6.00
Furnace coke, future	*9.00*	12.00	14.00	6.00
Foundry coke, prompt	*9.00*	11.00	18.00	7.00
Foundry coke, future	*10.00*	13.00	14.00	7.00
Metals,				
Per Lb. to Large buyers:	Cents	Cents	Cents	Cents
Lake copper, New York	15.00	15.00	17.50	21.75
Electrolytic copper, N. Y.	15.00	15.00	17.50	21.25
Zinc, St. Louis	*6.80*	6.90	7.37½	7.75
Zinc, New York	*7.25*	7.35	7.50	8.10
Lead, St. Louis	*6.50*	6.65	7.37½	6.50
Lead, New York	*6.75*	6.90	7.50	6.75
Tin, New York	*37.00*	39.50	41.50	53.75
Antimony (Asiatic), N. Y.	*6.25*	6.37½	7.00	8.87½

The prices in the above table are for domestic delivery and do not necessarily apply to export business.

capacity, taking in both steel works and finishing mills. One or two independents are running nearly full in their open-hearth departments, but against this are a number which are not running more than 40 per cent. Conditions with companies whose business was largely with the automobile industry are more depressed now than they have been at any time since the slump began, and the belief is gaining ground that the turning point in that industry has not yet arrived. Indeed, suggestions are heard that a Detroit manufacturer of low-priced cars has had a very disappointing response to the price reduction of several weeks ago and that another cut is not far off. Cancellations and suspensions of cold-finished steel bars and strips still are quite numerous.

The pig iron market is entirely a buyers' affair and while no general decline is observed from recent prices, this may be ascribed to the fact that producers, after several cuts which failed to stimulate the demand, have come to the conclusion that it is futile to try to interest buyers by further reductions. A further decline is observed in scrap iron and steel prices due to an utter lack of interest in the market on the part of melters. Still lower prices also have been established on coke, despite the fact that a large number of beehive ovens have been blown out since a week ago. The decline in production, however, has not been as rapid as the falling away in the demand, and oven operators who have figured on cutting coke production and shipping coal have done so with disappointing results, because there has been a further sharp decline in coal prices. As low as $5 per ton, at mines, has been done on gas and by-product grades of coal, while steam grade lately has been offered down as low as $3.50 at mines, which actually is under the basis of the lowest priced contracts.

Not much change has taken place in transportation conditions, which, with a number of companies, still leave much to be desired. The Pennsylvania Railroad imposed an embargo at midnight Nov. 6, which will be effective until 12 o'clock to-night. The modification of Interstate Commerce Commission order No. 20, releasing for general freight traffic, gondola cars with sides up to 42 in. in height, which became effective yesterday, so far has not helped the iron and steel plants. It is estimated that the railroads of the country have about 25,000 cars with sides running from 38 to 42 in., which would be released for general service by this modification. However, this total includes the bad order as well as serviceable cars and the benefit to be derived by the iron and steel industry further is minimized by the fact that the cars are scattered all over the country. It is noted that the National Tube Co. and Carnegie Steel Co., which move much of their products in open top cars, have added to their stocks in the past week.

Pig Iron.—Having made several ineffectual attempts by price reductions to interest buyers, the more common tendency of merchant producers now is to stand on the basis of the most recent sales and to let buyers name the prices they are willing to pay. It is frankly admitted by merchant furnace interests that no business is possible at the moment at the recent prices, but they also point out that no important sales have taken place at least in the steel making grades at below those figures and that in the lack of sales they are as nearly representative of the market as would be lower figures. No basic or Bessemer iron has been sold from Valley furnaces in the past week, although it has been currently reported that Valley basic iron had been offered at $36, furnace, and it is noted that a quotation of $41.50, Valley furnace, for a small tonnage of Bessemer failed to bring the order. A Pittsburgh district steel company which has a considerable stock of basic piled up has disposed of a couple of thousand tons for prompt delivery at $36, furnace. On the other hand, a merchant interest in this district, with furnaces in

the Valley, reports the sale within the past few days of 3000 tons of basic at $40 furnace. A few carloads of Bessemer have been moved at $42, Valley furnace. The Standard Sanitary Mfg. Co. has had an inquiry out for about 4000 tons of foundry iron for shipment over the remainder of the year in equal quantities to its Louisville, Ky., and Pittsburgh district plants. It is understood that the requirements for the former plant brought out quotations of from $38 to $41, Birmingham, with one producer quoting $42 for the base grade. Quotations on Northern iron are said to have ranged from $41 to $45, Valley furnace. The company has not yet covered. The highest price obtained on foundry iron recently on direct furnace sales was $44, Valley furnace, for a few carloads, but considerably more iron has been sold at $41, Valley furnace, and in view of the fact that other tonnages were to be had at the latter price a higher quotation does not seem justified. Small lots of gray forge iron have been sold at $40.

We quote Valley furnace, the freight rate for delivery to the Cleveland or Pittsburgh district being $1.96 per gross ton:

Basic	$38.50
Bessemer	$41.50 to 42.00
Gray forge	40.00
No. 2 foundry	41.00
No. 3 foundry	40.50
Malleable	42.00

Ferroalloys.—Trading is still at a standstill and quotations entirely are nominal. While both domestic and English 76 to 80 per cent ferromanganese still is quoted at $170, Atlantic seaboard, it is known that makers have offered to take $150 on first quarter of 1921 tonnages and at least one domestic maker has considerable tonnage piled up and for prompt delivery would be willing to accept even less than the latter price, it being stated that a firm bid of $140 seaboard, would get consideration. There is still a considerable tonnage of resale material, one steel company in the Pittsburgh district, which only a short time ago was trying to borrow small tonnages from other companies, having about 2000 tons it would like to sell. Reports have been heard of resale tonnages going as low as $135 and it is doubtful if any recent business of this character has been done at higher than $150. The market also is extremely inactive and inclined lower on spiegeleisen, which hardly is quotable on sales at higher than than $75, although makers are asking $2.50 and $5.00 per ton above that price. Considerably less than $70 is said to be done on resale tonnages outside the Pittsburgh district, although the general tendency of consumers who are covered by contracts is to seek suspension of shipments rather than to accept the alloy and try to resell it. The market in ferrosilicon, both high and low grades, is extremely indefinite but it is evident that supplies considerably exceed the demand and that quotations would be shaded against attractive tonnages.

We quote 76 to 80 per cent ferromanganese at $140 to $150, seaboard, for either domestic or English material, on direct sale for prompt delivery, and $150 for first quarter 1921 shipment; resale tonnages $135 to $150 seaboard. We quote average 20 per cent spiegeleisen nominal at $75 furnace and 50 per cent ferrosilicon nominal, $75 to $80 furnace, freight allowed. Bessemer ferrosilicon is quoted f.o.b. Jackson County and New Straitsville, Ohio, furnaces as follows: 9 per cent, $66; 10 per cent, $69.50; 11 per cent, $72.80; 12 per cent, $76.10. Silvery iron, 6 per cent, $56.50; 7 per cent, $58; 8 per cent, $60; 9 per cent, $62; 10 per cent, $64.50; 11 per cent, $67.80; 12 per cent, $69.80. The present freight rate from Jackson and New Straitsville, Ohio, into the Pittsburgh district is $4.06 per gross ton.

Plates.—The independent market generally has settled to 3c., although one or two makers still are quoting 3.25c. The latter, however, would consider desirable tonnages at 3c. Almost nothing is going on and quotations are merely nominal. Makers realize that business will not go forward actively except at well below their asking prices, but in the lack of inquiries do not know how much of a cut they should make to interest buyers. The leading independent has shut down its 110-in. plate mill and independent capacity generally is slowing down.

We quote sheared plates of tank quality, ¼ in. and heavier for early delivery from independent mills at 2.85c. to 3c. Pittsburgh. The Carnegie Steel Co. still quotes 2.65c. and is accepting business at that figure, but is not guaranteeing early delivery.

Structural Material.—Some of the steel fabricating interests in this district report inquiries to be somewhat more numerous than they were recently, but the general report still is one of dullness, and it also is observed that competition for business is extremely sharp. Independent shop operations, despite the handicap of a shortage of flat cars for shipments and in some cases a shortage of plain material, are averaging about 70 per cent of capacity. Only a few companies now have sufficient business to carry them beyond the first of the year and delivered prices on fabricated material as low as $90 per ton are reported to have been made recently. The Jones & Laughlin Steel Co. has been awarded 125 tons of steel for a building of the Duquesne Slag Products Co., Coatesville, Pa. So few lettings are being reported that, in addition to the expectation of lower prices, prospective investors are more disposed to hold off now than they have been at any time recently. The independent market in plain material continues to recede. A leading independent in this district now is quoting 3c. for structural beams as against its recent base of 3.10c. All independent companies now are willing to take business in plates for structural purposes at 3c. Pittsburgh, and it is reported that Eastern mills are offering them at 2.90c. Pittsburgh.

Billets and Sheet Bars.—Although independent steel works operations now do not average more than 50 per cent of capacity, the market in semifinished steel is still seeking lower levels, owing to the extremely limited demand. Dwindling finishing mill operations are reflected in smaller specifications against contracts, and also a marked paucity in the demand for spot tonnages. There seems to be little justification for a quotation of higher than $60 for sheet bars to-day, as it is evident that several independent makers have tonnages for which they would be glad to get that price, and the report is current that one maker, anxious for business, has named the Steel Corporation price of $47, Pittsburgh or Youngstown, in an effort to interest buyers. A cut of $5 per ton also seems justified in independent prices on 4 x 4-in. rerolling billets. Some makers continue to name $60, but others are offering them at $55 and even $50, while a middleman recently had an offering of 1000 tons commercial billets, rolled from full ingots, at $45. Little is going on in forging billets and they also are available at a recession of about $5 per ton from recent quotations.

We quote 4 x 4-in. soft Bessemer and open-hearth billets at $38.50 to $55; 2 x 2-in. billets, $42 to $58.50; Bessemer sheet bars, $47 to $60; open-hearth sheet bars, $47 to $60, and forging billets, ordinary carbons, $60 to $65 base, all f.o.b. Youngstown or Pittsburgh mill.

Wire Rods.—Although some independent makers continue to quote ordinary soft rods at $75, little has been done at that figure in sales, and as it is known that tonnages are being offered by some mills at $70, the latter price appears to be more representative of the maximum independent market, and quotations have been revised accordingly. Non-integrated wire products manufacturers not only have experienced a considerable decline in business, but are inclined to defer rod purchases because of the expectations of lower prices. Another factor in the situation is that the American Steel & Wire Co. now is operating at a scale which enables it to be somewhat more generous in its allotments to regular customers. The latter company has been accepting orders from its regular customers, subject to revision and for shipment at its own convenience. For a time, only a small portion of the business submitted was accepted. Prices are given on page 1299.

Wire Products.—Larger operations and shipments by the leading interest are affecting demands on the independent companies. While most of them are doing a fair business, and a Youngstown maker is said to have taken some nails recently at $4.50 base, per keg, urgency by buyers to get on the books of the independent companies has passed and they also are more prone to seek price recessions. Some cancellations and suspensions still are coming to independent companies, and the backlog of some of them now consists chiefly of business taken below current quotations. Mill operations in the Pittsburgh district range from about 65 to 75 per cent of capacity.

We quote wire nails at $3.25 base, as the price of the American Steel & Wire Co., and $4.25 to $4.50 by independent mills. We quote bright basic wire at $3.25, the price of the American Steel & Wire Co. and $3.75 to $4, the price range of the independent mills.

Tin Plate.—Independent prices as typified in quotations against stock items are distinctly weaker. Such stock now can be bought as low as $7.50 per base box, and even for less than carload lots is not quotable at higher than $8.50. These prices compare with $9 and $10 only a few weeks ago. Makers of cans for condensed milk are holding up shipments due to the demoralized market in that commodity. In other directions, shipments are going forward normally. The range on production plate remains at from $7, the Steel Corporation quotation, to $8.50, at which some of the independent companies took last quarter business. These quotations are merely nominal, and will remain so until the leading interest has named the basis for the first half of 1921. The report is current, but not verified, that the leading interest will hold to $7 per base box, until it completes its present obligations, and then will announce a reduction. The export demand for tin plate is at standstill and it is doubtful whether sales to-day could be made as high as $10 per base box.

We now quote tin plate to domestic consumers at $7 to $8.50 base box; stock items, $7.50 to $8.50, and for export, $9 to $10 per base box, all f.o.b. Pittsburgh.

Steel Rails.—The Cambria Steel Co. still is quoting light rails at 3.50c. for 25 to 45-lb. sections and reports sales at that base. Another independent comppany is holding 3c. and it is believed even that figure could be shaded on light sections rolled from old rails.

We quote 25 to 45-lb. sections from 2.45c., the price of the Carnegie Steel Co., to 3c. to 3.50c., the range of the independent makers rolling from new steel; 16-lb. and 20-lb. sections are priced 4½c. per 100 lb. higher than the base sizes, 12-lb. and 14-lb. sections 9c. per 100 lb. above base and 8-lb. and 10-lb. sections 13½c. per 100 lb. above base. Standard sections, 50 lb. and heavier, are quoted by the Carnegie Steel Co. at $45 for Bessemer and $47 for open hearth stock and by independent mills from $55 to $65 for Bessemer and $57 to $67 for open-hearth rails.

Iron and Steel Bars.—The independent market on merchant steel bars still is quotable at 3c. to 3.25c., base, but so little is going on that these figures have little real basis. Independent mills have only a moderate back log of orders, but are disposed to clean them up before seeking more business. Hence the relative steadiness of prices. No strictly common iron bars are produced in this district and quotations, accordingly, are revised to the delivered Pittsburgh price of Eastern and Western makers.

We quote steel bars rolled from billets at 2.35c., this being the price of the Carnegie Steel Co. for very indefinite delivery, likely not before first quarter of next year. Other mills rolling steel bars from billets quote from 3c. to 3.25c. at mill, prices depending entirely on the buyer and the delivery wanted. We quote reinforcing bars, when rolled from billets, at 3.25c. to 3.50c., and from old steel rails at 3c. at mill. We quote common iron bars at 4.75c. and refined iron bars at 5c. to 5.50c. in carloads, f.o.b. mill, Pittsburgh.

Iron and Steel Pipe.—The situation is featured by an effort on the part of several of the Standard Oil companies to line up their requirements for 1921, and the fact that practically all of the independent companies have had a chance to quote against these requirements. The Prairie Pipe Line Co., which recently put out an inquiry for about 40,000 tons of oil country tubular goods, for early 1921 delivery, has succeeded in placing the bulk of this business with independent companies in Pittsburgh, Wheeling and Youngstown. Pressure for supplies of both oil country and standard pipe remains heavy, and while mill operations are relatively high, the scarcity of cars still is resulting in poor distribution. The National Tube Co. has not been able to reduce its stocks of finished material and the finishing mills at its Riverside works, Benwood, W. Va., still are idle. Price discounts are given on page 1299.

Cold-Finished Steel Bars.—The situation is even more depressed now than it has been, as other consumers beside automobile manufacturers have come to the conclusion that lower prices are ahead and they are withholding specifications or cancelling tonnages carrying high prices. The great bulk of the backlog of business is in tonnage placed at the old base of 3.60c. which now are being reached because of the cancellations and suspensions in higher priced material. All independent companies nominally are quoting 4.25c. base against new inquiries but that figure is finding very little basis in sales. The American Steel & Wire Co. base is 4c.

Nuts, Bolts and Rivets.—There has been a considerable decline in demand and with raw material and shipping conditions steadily improving, makers are rapidly catching up with their old obligations, and the market is beginning to develop a weaker tendency. Recent prices on rivets still are quoted by all companies, but it is admitted that new demands are few and small and that a number of shipbuilders have surplus stocks which they are offering at concessions from regular quotations. Conditions steadily are growing easier in regard to large bolts as few makers now are having any trouble in getting comparatively full supplies of bars. Shipments of drawn wire, however, still are moderate and this affects the production of small bolts. While some plants in the Pittsburgh district are running full, capacity. Prices and discounts are given on page 1299. the average is not much in excess of 70 per cent of

Spikes.—While a few fairly good inquiries for railroad spikes are coming out, actual orders are small and with makers rapidly catching up with their old orders, deliveries as early as three weeks now are being promised. The situation is comparatively strong in small spikes as makers have enough live business on their books to keep them busy over the remainder of the year. Prices are given on page 1299.

Sheets.—Prices of independent mills against early tonnages continue to slide, in the lack of any considerable amount of business of this sort. Buyers now are having practically no trouble in obtaining black sheets at 6c., base, at which price several independents have evinced a willingness to take business. As low as 4.75c. has been done on blue annealed sheets and 5c. has been exceeded rather infrequently, and then for the lighter gages or for small tonnages. Independent mills generally are quoting 8c. and 8.25c. on galvanized, but some business recently has gone on the books as low as 7.50c. Specifications by the automobile interests against high-priced contracts still are being withheld to a large extent, and other consumers, who came in on the rise, also are inclined to seek suspensions. The leading interest, outside of automobile sheets, reports considerable pressure for shipments against contracts. This company still is suffering from a shortage of steel, but is running about 75 to 80 per cent of its capacity. Independent operations are on a somewhat lower scale. Prices are given on page 1299.

Hoops and Bands.—Business is practically at a standstill and specifications against old orders placed at advances over the Steel Corporation price are not especially heavy. Independent makers are holding to recent quotations because of their lack of knowledge as to a price that might appeal to buyers, and because a reduction now, it is believed, would not stimulate buying. The Steel Corporation price is 3.05c., with the independents quoting from 4c. to 5c.

Hot and Cold-Rolled Strips.—Although occasional sales of cold-rolled strips are still heard of at 8.50c. base, practically all makers now are quoting 8c. flat, and it is doubtful whether any new business is going on the books of makers at any higher figure. The American Steel & Wire Co. is quoting 6.25c base and this makes the full range on cold-rolled strips from 6.25c. to 8c. Hot-rolled strips are at 5c. base, with all of the independent makers. New demands for both grades are extremely light and there is an unusual amount of requests for suspensions and for deferred datings. The recovery in the automobile industry is much slower than was anticipated and other users of strip steel seem to have the notion that by holding off they will obtain tonnages at lower prices.

Boiler Tubes.—New demands are tapering off because buyers generally have the idea that lower prices will be reached in the present readjustment of steel prices. No reductions, however, have been announced and practically all makers have bookings which will carry them well over the remainder of the year, and in some instances well into 1921. On steel boiler tubes, there are indications that some independent makers might come pretty close to the National Tube Co. discounts against what might be regarded as desirable business. Discounts are given on page 1299.

Cut Nails.—Effective Nov. 1, the Reading Iron Co. has marked down its base prices to 6.25c. f.o.b. Potts-

town and Birdsboro, Pa., in carload lots and 6.50c. for less than carload lots. Coincident with this change, however, the company has issued a new card of extras, revising upward, the advance to be paid over base on those sizes, which previously had shown no profit or a slight loss. LaBelle Iron Works is holding to the old card of extras and to the former basis of 6.25c. f.o.b. Wheeling in carload lots and 6.50c. for less than carload lots. Demand for cut nails in this district always is limited and at present it is more restricted than usual.

Old Material.—Further recessions of about $1.00 per ton are noted in the various grades of steel works scrap iron and steel. While the leading interest is running as full as possible in its steel works, it seems to have ample supplies of scrap for the present and is out of the market. Independent steel companies steadily are slowing down in their open-hearth departments and as all have bought scrap in quantities for comparatively full operation, they also are out of the market for the present. They are not interested even in low-priced offerings and prices consequently are being established on sales between dealers. The latter, who have contracts with steel mills, are anxious to have them completed before there is any further decline in steel works operations and in some cases overshipments have been attempted. The mills, however, are refusing to take more than their contracts call for and this results in the appearance on the market of a great many so-called distress tonnages. Material which has to be reconsigned promptly to save demurrage has to be priced extremely low in order to be sold. This sort of business accounts for the quotations of $25 on heavy melting grade, which, if the steel manufacturers sought to buy, probably could not be had at less than $26. The slowing down in machine shop activities has added something to the scarcity of turnings and borings, but a fair amount of heavy breakable cast is available and consumers assert that if they wanted tonnages they probably could get them as low as $29 delivered. The fact that pig iron has slumped has resulted in a dull and weak market in No. 1 cast scrap for cupolas, which now is available as low as $35.

We quote for delivery to consumers' mills in the Pittsburgh and other districts that take Pittsburgh freight rates as follows:

Heavy melting steel, Steubenville, Follansbee, Brackenridge, Monessen, Midland and Pittsburgh, deliv.	$25.00 to $26.00
No. 1 cast for cupolas	35.00 to 35.50
Rerolling rails, Newark and Cambridge, O.; Cumberland, Md.; Franklin, Pa., and Pittsburgh	37.00 to 38.00
Compressed sheet steel	21.50 to 22.00
Bundled sheet sides and ends, f.o.b. consumers' mills, Pittsburgh district	16.00 to 16.50
Railroad knuckles and couplers	26.50 to 27.00
Railroad coil and leaf springs	26.50 to 27.00
Railroad grate bars	27.00 to 28.00
Low phosphorus melting stock (bloom and billet ends, heavy plates, ¼-in. and heavier)	32.00 to 33.00
Railroad malleable	31.50 to 32.00
Iron car axles	52.00 to 53.00
Locomotive axles, steel	42.00 to 43.00
Steel car axles	38.00 to 39.00
Cast iron wheels	39.00 to 40.00
Rolled steel wheels	26.50 to 27.00
Machine shop turnings	15.50 to 16.00
Sheet bar crop ends (at origin)	28.00 to 29.00
Heavy steel axle turnings	21.00 to 22.00
Short shoveling turnings	18.00 to 19.00
Heavy breakable cast	30.00 to 30.50
Stove plate	27.50 to 28.00
Cast-iron borings	18.00 to 18.50
No. 1 railroad wrought	27.00 to 28.00

Coke.—Another dollar per ton has been lopped off the price of spot tonnages of beehive oven coke since a week ago, furnace grade now being quotable at $8 to $8.50 and 72-hr. fuel at $9 to $9.50. Although there has been a considerable cut in production, the supply has continued in excess of the demand and on some tonnages of furnace coke, which have been suspended while in transit and reconsignment was necessary, a price as low as $7 per ton has been done. Declining prices for pig iron make for a conservative demand and the beehive oven operators also are having a good deal of competition from by-product coke, which is being offered by some of the steel companies that have retired blast furnaces. Practically no interest is yet apparent in first half of 1921 tonnages and contracts for supplies over the remainder of the year are extremely few. One such contract, however, is reported to have been negotiated on a scale arrangement on ratio of five to one on Valley basic pig iron. It is believed that operators would gladly take first half furnace coke contracts at a fixed price of $9 per net ton oven, but that figure to-day is considerably above the price idea of the furnace interests. The contract market in foundry fuel is nominal in the lack of business of that sort.

Easier Conditions in the Refractories Market

PITTSBURGH, Nov. 8.—While there has been no change in prices of blast furnace and steel works brick, the situation distinctly is easier than it has been before in several weeks, and indications point to a decline in the near future. A number of blast furnaces are idle and some of them are reported to have been blown out for relining, but this condition has found no reflection in the demand or specifications for blast furnace grades of brick. This probably is accounted for by the fact that there has been a pretty constant improvement in shipping conditions during the past several weeks and ample supplies appear to be available for such relining work as is in progress. Independent steel companies are not averaging more than 50 per cent operations of their open hearth furnaces and this situation has resulted in a large number of suspensions of shipments against contracts.

With car supplies practically normal, no difficulty now is being experienced in the matter of shipments, and the slowing up in the demand for coal and the sharp recessions in the prices of that product remove another argument in favor of present prices for fire clay and silicon brick. Fire clay brick plants have been running at a very low rate lately, due to the fact that such high wages were obtainable in adjacent coal mines that the men quit the clay for the coal mines and the production of clay fell off sharply. With the passing of fancy prices for coal, the operators no longer can afford to pay extra high wages to the miners and the supply of labor for the clay mines is likely to be soon practically normal. The drop in coal prices should enable makers of silicon brick to make some cut in their operating costs. Standard size of chrome brick now is quotable as low as $90.00 per net ton, due to the weaker market in the base material.

We quote per 1000 f.o.b. works:

	High Duty.	Moderate Duty.
Fire Clay:		
Pennsylvania	$50.00 to $60.00	$45.00 to $50.00
Ohio	47.00 to 55.00	40.00 to 45.00
Kentucky	50.00 to 55.00	45.00 to 50.00
Illinois	50.00 to 60.00	40.00 to 50.00
Missouri	60.00 to 65.00	45.00 to 55.00
Silica Brick:		
Pennsylvania		55.00 to 60.00
Chicago		65.00
Birmingham		55.00 to 60.00
Magnesite Brick:		
Standard size, per net ton		110.00
Chrome Brick:		
Standard size, per net ton		90.00 to 100.00
Bauxite Brick:		
55 per cent per net ton		50.00
76 per cent per net ton		90.00

Conditions in Fabricating Trade

It appears on good authority that shipments in September from bridge and other structural shops of fabricated steel work amounted to 125,000 to 135,000 tons against a total volume of new business put on the books of 77,500 tons. It will thus be seen that shipments were nearly double the amount of new business. Inroads have accordingly been made on the volume of orders remaining on the books, so that there is probably about 2¾ months' business ahead of the shops of the country on Oct. 1, against somewhat more than 3 months' work on the books on Sept. 1 and 3½ months' work on Aug. 1.

The material shipped in the nine months of the year is about equal to the volume of business booked in the same time. The percentage of improvement of September bookings over August, mentioned in the issue of Oct. 21 as 7½ per cent, was a little better than the increased rate of shipments, but of course the volume of shipments has materially exceeded the inflow of new business over a number of months.

Chicago

CHICAGO, Nov. 10.

In the main the market in finished steel has undergone few changes since a week ago. In the absence of activity independent quotations on plates, shapes and bars are fast becoming nominal, and only a revival of business will give stability to prices. It is evident that a few independents would not refuse attractive orders for plates and shapes if offered at the Steel Corporation prices, and in the case of mild steel bars it is intimated that the same would hold true of at least one Western independent. Such business, however, would be taken only on the basis of prompt delivery, as the mills are pursuing a cautious course and, while willing to take on business at low prices, temporarily, do not wish to commit themselves for any period ahead on that basis. Rail carbon steel bars have weakened and at least two makers are now quoting from 3.25c. to 3.50c., mill.

Although producers are still holding to their prices officially, cast iron pipe is soft and here and there concessions of a few dollars a ton have been made. The pig iron market is exceedingly quiet and even resale material offered at $3 to $6 below the producers' quotations is moving very slowly. Scrap is exceedingly weak, prices having broken sharply during the past few days.

The operating situation remains substantially unchanged. All of the furnaces represented by the leading merchant pig iron seller are still producing. The leading steel interest continues to operate at 85 per cent of capacity, the foremost independent at 50 to 60 per cent, while the Wisconsin Steel Works has increased its output to 90 per cent of normal. The alloy steel department of the Interstate Iron & Steel Co., on the other hand, is operating on a reduced scale.

Fuel continues to show signs of weakening. Contracts for Illinois screenings can now be closed at $3, mine, and prepared sizes can be had for $4, mine. Good foundry coke is available at $10.50, Connellsville, and offerings at as low as $8 and $7 are reported.

Pig Iron.—The market is even less active than heretofore—so quiet, in fact, that even resale material offered at $3 to $6 below producers' quotations is finding few buyers. Merchant furnaces in this territory are still in blast with business ahead, but reports from other districts, particularly the South, indicate that stacks are being blown out. Thus far no merchant iron producers selling in this territory have shown a disposition to reduce prices. Apparently makers recognize that for the time being resale iron dominates the situation and feel that price concessions would not bring out business in the face of an almost negligible demand. The quotations published below represent minimum resale prices and the higher quotations those of producers.

The following quotations are for iron delivered at consumers' yards except those for Northern foundry, malleable and steel-making irons, including low phosphorus, which are f.o.b. furnace and do not include a switching charge averaging 70c. per ton.

Lake Superior charcoal, averaging sil. 1.50 (other grades subject to usual differentials), deliv. at Chicago	$53.50 to $58.50
Northern coke, No. 1 sil. 2.25 to 2.75	$42.25 to 48.25
Northern coke foundry, No. 2, sil. 1.75 to 2.25	40.00 to 46.00
Northern high phos.	40.00 to 46.00
Southern coke, No. 1 foundry and No. 1 soft, sil. 2.75 to 3.25	47.67 to 51.67
Southern coke, No. 2 foundry, sil. 2.25 to 2.75	45.92 to 49.92
Southern foundry, sil. 1.75 to 2.25	44.67 to 48.67
Malleable, not over 2.25 sil.	40.50 to 46.50
Basic	40.00 to 46.00
Low phos. (copper free)	50.00 to 57.00
Silvery, 7 per cent	55.30 to 58.32

Ferroalloys.—More resale material has appeared and ferromanganese is now available at $150 to $160, delivered, and spiegeleisen at $65, furnace. The market is exceedingly dull.

We quote 75 to 80 per cent ferromanganese, seaboard, $165 to $170; resale, $150 to $160, delivered; 50 per cent ferrosilicon at $85; delivered; spiegeleisen, 18 to 22 per cent, $80 to $85 furnace; resale, $65, furnace.

Plates.—With little new business developing, the market situation is substantially the same as a week ago. Some of the independents show a willingness to meet the Steel Corporation price temporarily at least, rather than have their mills idle, but none has shown a disposition to commit its capacity through first quarter on that basis. As was noted last week, the leading local independent will accept orders at that price for early delivery, when accompanied by specifications and the tonnages involved are attractive, and the same can be said of at least one Ohio mill. Just what prices would be quoted on less desirable business is uncertain at present writing. The quotation of 3.25c., Pittsburgh, on tank plates, which is still adhered to by some mills, is fast becoming nominal. The leading interest has not yet made any announcement as to prices and is closing no contracts. It continues to take new orders for indefinite delivery, however, when the specifications are attractive. On this business, of course, present prices govern. An inquiry from the Southern Railway for 2000 box cars, now being figured on by Western car builders, will involve 10,000 tons of plates, shapes and bars.

The mill quotation is 2.65c. to 3.25c., Pittsburgh, the freight to Chicago being 38c. per 100 lb. Jobbers quote 3.78c. to 4.28c. for plates out of stock.

Structural Material.—Inquiry is light and in this district, at any rate, independent quotations of 3.10c., Pittsburgh, on plain material are largely nominal. The local independent will accept attractive specifications calling for early delivery at the Steel Corporation price, as was indicated in this paragraph last week. Just what prices would govern on less desirable tonnage is not clear at present writing. In the fabricating field, interest is centered in the Federal Reserve Bank building, the general contract for which has been awarded to the John Griffiths & Son Co. of this city. The name of the successful bidder on the structural steel, amounting to nearly 9000 tons, has not yet been announced. Recent lettings include:

Main Street Theater, Kansas City, 400 tons, to Kansas City Structural Steel Co.

Art Institute, Chicago, Plaza covering, 293 tons, to Union Foundry Co.

Sinclair Refining Co., Chicago, punched plates, 115 tons, to unnamed fabricator.

International Harvester Co., cupola building, Canton, Ill., 104 tons, to unnamed fabricator.

Pending inquiries include:

Union Liberty Furniture Co., building, Chicago, 500 tons, bids to be opened to-day.

California Avenue Bridge, Chicago, 1500 tons, Green & Sons Co., general contractor.

High school, River Rouge, Mich., 400 tons.

Bridges, Jefferson Avenue and Fort Street, River Rouge, Mich., 145 tons.

Junior Orpheum Theater, Minneapolis, 1000 tons.

United Indian Forest Exploitation Co., Amsterdam, Holland, 630 tons for sawmill, Netherlands, Simaloer, an island near west coast of Sumatra.

Universal Oil Products Co., Chicago, nine tanks, 80 tons.

The mill quotation is 2.45c. to 3.10c., Pittsburgh, which takes a freight rate of 38c. per 100 lb. for Chicago delivery. Jobbers quote 3.58c. to 4.08c. for materials out of warehouse.

Sheets.—Not wishing to commit themselves far ahead, most independent mills are proceeding cautiously in booking new business. For early delivery, however, the ruling prices in this territory are 5c. base, Pittsburgh, for blue annealed, 5.50c. for black and 7.50c. for galvanized. A few mills have indicated a willingness to take first quarter contracts on the basis of 5c. base, Pittsburgh, for blue annealed, 5.75c. for black and 7.75c. for galvanized.

Mill quotations are 4.35c. to 5.75c. for No. 28 black; 3.55c. to 5c. for No. 10 blue annealed, and 5.70c. to 7.75c. for No. 28 galvanized, these all being Pittsburgh prices, subject to a freight to Chicago of 38c. per 100 lb. The lowest prices are those of March 21, 1919.

Jobbers quote: Chicago delivery out of stock, No. 10 blue annealed, 7.13c.; No. 28 black, 8.10c.; No. 28 galvanized, 9.60c.

Bars.—Owing to suspensions of orders, mills are able to make fairly early delivery on some sizes which will fill gaps in their rolling schedules. The leading interest, however, is accepting no contracts in mild steel bars, not yet having announced its future price policy. Such business as it is taking at present prices is for delivery at convenience of the mills. The foremost local independent has reduced its back log materially by employing its rail carbon steel bar mill for a time on billet steel, and has recently taken orders at from 3c. to 3.25c. base, Pittsburgh. While the market remains very quiet, it is to be noted that requests for suspensions are fewer and that consumers who refused to place any orders whatsoever are now buying small tonnages for imme-

diate needs. Independent quotations seem to be settling to a level of 3c., Pittsburgh, and it is felt that an attractive tonnage offered to the mills at the Steel Corporation price would find takers under present conditions. Little new business in bar iron is developing and the mills having commitments for about six weeks ahead are adhering to the quotation published below. The market in rail carbon steel bars is weakening and at least two makers are quoting from 3.25c. to 3.50c., mill.

Mill prices are: Mild steel bars, 2.35c. to 3.25c., Pittsburgh, taking a freight of 38c. per 100 lb.; common bar iron, 3.75c., Chicago; rail carbon, 3.25c. to 3.75c. mill.

Jobbers quote 3.48c. to 3.98c. for steel bars out of warehouse. The warehouse quotation on cold rolled steel bars is 5.90c. for rounds and 6.40c. for flats and squares, an extra of 15c. per 100 lb. applying to orders exceeding 1000 lb. and under 2000 lb. and an extra 35c. on orders up to 1000 lb. Jobbers quote hard and medium deformed steel bars at 4.38c. base.

Rails and Track Supplies.—Although independents continue to book a few orders for track bolts and spikes for early delivery, inquiry for tie plates for prompt shipment has fallen off markedly within the past few weeks. No further changes in prices have developed. The leading interest has not yet made announcement as to its quotation on rails and fastenings for the coming year, and in the meantime continues to close contracts with Western roads at prices to be fixed later.

Standard Bessemer rails, $45 to $55; open-hearth rails, $47 to $57. Light rails, 2.45c. to 3.50c., f.o.b. makers' mills. Standard railroad spikes, 3.35c. to 4c., Pittsburgh. Track bolts with square nuts, 4.60c. to 5c.; Pittsburgh. Steel tie plates, 3c. to 3.50c. and steel angle bars, 2.75c., Pittsburgh and Chicago; tie plates, iron, 3.75c. to 4c., f.o.b. makers' mills.

Wire Products.—In the face of increasing reports of reduced consumption in certain parts of the country, notably the South, the current season, which is ordinarily dull, is an exceptionally busy one for the leading interest. Although even this producer has received some cancellations and suspensions, these have come largely from the manufacturing trade, whereas the demand for wire nails and barbed wire is still heavy and inquiry for plain wire is of substantial proportions. It is naturally to be expected, of course, that in a slackening market the foremost producer, because of its prices, will be affected last. That independents are adding little to their present bookings is common knowledge, yet they have not reduced their back logs to a point where the need for new business has become urgent. The local independent, for example, has commitments which will carry it well beyond the end of the year. For mill prices, see finished iron and steel, f.o.b. Pittsburgh, page 1299.

Cast Iron Pipe.—Although producers are still officially adhering to their prices, the market is weakening and in a few instances concessions of a few dollars have been made. Fort Wayne, Ind., has let 133 tons to the National Cast Iron Pipe Co. Duluth has awarded 132 tons to the same maker.

We quote per net ton f.o.b. Chicago, ex-war tax as follows: Water pipe, 4-in., $88.10; 6-in. and above, $83.10; class A and gas pipe, $4 extra.

Bolts and Nuts.—Although new business is still in substantial volume, it is not of the proportions of a few months ago and some of the makers who participated in the recent advance are showing a willingness to make concessions. There are at present really three levels of prices, those published on page 1299, and a lower level quoted by at least one important interest. Cancellations, which were heavy throughout October, have abated considerably. An automobile manufacturer who recently cancelled large orders is now in the market for a half a million mill wheel bolts and several million nuts. Several good inquiries have been received from jobbers.

Jobbers quote structural rivets, 5.08c. to 5.73c.; boiler rivets, 5.18c. to 5.83c.; machine bolts up to ¾ x 4 in., 20 per cent off; larger sizes, 10 off; carriage bolts up to ¾ x 6 in., 10 off; larger sizes, 5 off; hot pressed nuts, square tapped and hexagon tapped, list price plus $1.15; blank nuts, list price plus $1.15; coach or lag screws, gimlet points, square heads, 30 per cent off. Quantity extras are unchanged.

Old Material.—The market is exceedingly weak and such transactions as are taking place indicate that prices are dropping rapidly. Although under present conditions it is difficult to ascertain ruling market quotations, those published below are conservative. In some grades for which there is no demand whatever, even from dealers, prices have no significance. Thus No. 1 railroad wrought is a drug on the market and is considered less desirable than No. 2 wrought. Foundry grades are not moving and flashings are dead. Railroad offerings include the Pennsylvania Southwest 3500 tons, the Great Northern 3000 tons, the Pere Marquette 2000 tons, the Wabash 1500 tons, the Grand Trunk Western 600 tons and the Nickel Plate 500 tons.

We quote delivery in consumers' yards, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton	
Iron rails	$28.50 to $29.00
Relaying rails	50.00 to 55.00
Car wheels	33.00 to 33.50
Steel rails, rerolling	24.00 to 24.50
Steel rails, less than 3 ft.	21.00 to 21.50
Heavy melting steel	18.50 to 19.00
Frogs, switches and guards, cut apart	18.50 to 19.00
Shoveling steel	18.00 to 18.50
Low phos. heavy melting steel	22.00 to 22.50
Drop forge flashings	13.00 to 13.50
Per Net Ton	
Iron angles and splice bars	28.50 to 29.00
Steel angle bars	18.00 to 18.50
Iron arch bars and transoms	31.50 to 32.00
Iron car axles	36.00 to 36.50
Steel car axles	26.00 to 27.00
No. 1 busheling	17.00 to 17.50
No. 2 busheling	10.00 to 11.00
Cut forge	16.50 to 17.00
Pipes and flues	12.00 to 12.50
No. 1 railroad wrought	16.50 to 17.00
No. 2 railroad wrought	16.50 to 17.00
Steel knuckles and couplers	18.50 to 19.00
Coil springs	21.50 to 22.00
No. 1 cast	22.00 to 23.00
Low-phos. punchings	20.00 to 21.00
Locomotive tires, smooth	13.00 to 14.00
Machine shop turnings	8.00 to 8.50
Cast borings	10.50 to 11.00
Stove plate	23.00 to 23.50
Grate bars	16.50 to 17.00
Brake shoes	14.50 to 15.00
Railroad malleable	19.50 to 20.00
Agricultural malleable	19.50 to 20.00
Country mixed	11.00 to 12.00

Boston

BOSTON, Nov. 9.

Pig Iron.—Conditions governing the market are unchanged. Business is confined to resale iron, generally Buffalo or Pennsylvania, and is limited, due to the fact that most foundries are fully covered well into 1921. Resale prices take a wide range, $2 to $10 a ton under the furnace base, depending on how badly the foundry wants to sell. Furnaces, in the meantime, are marking time at $50 furnace base for Buffalo and eastern Pennsylvania, $47 to $50 for Virginia, and $42 for Alabama, these quotations being purely nominal. Requests for cancellations are increasing and in special instances furnaces are giving consideration. Requests for deferred shipments also are larger. Foundries, as a whole, are growing less active and many are on short time or operating with reduced forces. For the first time in many months, there is a surplus of molders. The largest sale of resale iron reported this week is one of 100 tons No. 1 x Buffalo at $46 furnace. Otherwise transactions were in car lots. Delivered resale pig iron prices follow:

Eastern Pa., sil. 2.25 to 2.75	$48.31 to $49.31
Eastern Pa., sil. 1.75 to 2.25	47.06 to 48.06
Buffalo, sil. 2.25 to 2.75	48.71 to 49.71
Buffalo, sil. 1.75 to 2.25	47.46 to 48.46
Virginia, sil. 2.75 to 3.25	52.58 to 53.58
Virginia, sil. 2.25 to 2.75	50.83 to 51.83
Virginia, sil. 1.75 to 2.25	49.58 to 50.58
Alabama, sil. 2.75 to 3.25	52.66 to 55.66
Alabama, sil. 2.25 to 2.75	50.91 to 53.91
Alabama, sil. 1.75 to 2.25	49.66 to 52.66

Coke.—Now that business has materially decreased, foundries are anxious to stop shipments of coke to them and deferred shipment requests have been heavy since last reports, while few, if any, 1921 contracts have been signed up. The New England Coal & Coke Co. continues to quote 1920 foundry coke at $22.70 delivered where the freight rate does not exceed $3.40 a ton, but is having difficulty in placing car lots inasmuch as Connellsville is obtainable at $18.50 delivered, or $12

ovens, and less. One broker recently circularized the foundry trade on Connellsville coke at $19.20 delivered, and did not receive a single reply.

Warehouse Business.—The recent reduction in iron and steel prices has curtailed the consumptive demand, especially that for iron on which quotations are barely steady with every indication of breaking below those for steel. Local supplies of both materials are larger than they have been in months, and bands also are arriving more freely. The demand for structural steel is flat. Fewer bolts and nuts are going into consumption and prices are barely steady. The Reading Iron Co. announces a reduction of 50c. per keg in cut nails, but has issued a new list of extras. Local wire nail quotations take a wide range, but they nevertheless are nearer than they were a month ago. Some makes of lock washers are easier.

Jobbers now quote: Soft steel bars, $5 to $7.50 per 100 lb. base; flats, $6 to $6.35; concrete bars, $5; tire steel, $6 to $6.50; spring steel, open hearth, $10; crucible, $15; steel bands, $8 to $8.25; steel hoops, $9; toe calk steel, $7.50; cold-rolled steel, $8 to $10; structural, $4.50 to $6.50; plates, $4.75 to $5.25; No. 10 blue annealed sheets, $7.25; No. 28 black sheets, $9.15; No. 28 galvanized sheets, $10.50; refined iron, $5 to $7.50; best refined, $7; Wayne, $9.50; band iron, $8; hoop iron, $9; Norway iron, $20.

Finished Material.—Bids are in on 230 tons of structural for the Connecticut Adamant Plaster Co., New Haven, Conn., but aside from this prospect the market is quiet. Shapes generally are quoted at 3.10c., f.o.b. Pittsburgh, but small tonnages have been booked as low as 2.80c. Plates are quiet at 3.25c., Pittsburgh, the top price, with most mills asking 2.75c. New England railroads are expected to enter the market this month for first quarter, 1921, requirements. One sale of 160 tons of bars at less than 3c., f.o.b. Pittsburgh base, is reported, but business otherwise is largely confined to car lots and odd carbon content bars, at 3.25c. or less. The Boston Elevated Railway probably will close on its rail requirements this week, and the Boston & Maine Railroad is sounding out the market on approximately 20,000 tons of 1921 rails. Requests for deferred mills shipments have increased of late, and those for cancellations also are larger, and to satisfy the latter, mills in some instances are reducing contract prices to present market quotations.

Old Material.—Foundries are resorting to all sorts of measures to forestall deliveries of machinery cast, the most common practice being rejections. One shipper, who delivered six cars this week, had all rejected. A few cars of strictly No. 1 machinery have been taken, however, at $40 to $41 delivered. The movement of stove plate is confined to old contracts. A limited tonnage of heavy melting steel at $17.50 f.o.b. shipping point has been bought by a broker this week, but otherwise the market is at a standstill. Approximately 600 tons, in small lots, of borings and turnings have been purchased by brokers here for Pennsylvania blast furnaces, at $18.50 delivered. There is a limited market for cotton ties at $15 delivered. The General Electric Co., West Lynn, Mass., last week sold 60 cars of old material and obtained full market quotations, the quality of offerings being excellent. Prices as quoted at the local yards follow:

No. 1 heavy melting steel	$16.00 to $17.50
No. 1 railroad wrought	22.00 to 23.00
No. 1 yard wrought	19.00 to 20.00
Wrought pipe (1 in. dia., over 2 ft.)	15.00 to 16.00
Machine shop turnings	12.00 to 13.00
Cast iron borings	15.00 to 15.50
Heavy axle turnings	13.00 to 14.00
Blast furnace borings and turnings	11.00 to 12.00
Forged scrap	10.00 to 11.00
Bundled skeleton	10.00 to 11.00
Street car axles	28.00 to 30.00
Car wheels	34.00 to 35.00
Machinery cast	37.00 to 38.00
No. 2 cast	35.00 to 36.00
Stove plate	24.00 to 25.00
Railroad malleable	25.00 to 26.00
Rerolling rails	28.00 to 29.00

The Detroit branch of the Wetmore Reamer Co. of Milwaukee, Wis., has organized a new company to handle the sale of Wetmore expanding reamers in the Lower Peninsula of Michigan. James J. Ward has resigned as assistant sales manager to become one of the three members of the new firm, which will be known as the Wayman-Taylor-Ward Co., with offices at 403 Real Estate Exchange Building, Detroit.

Buffalo

BUFFALO, Nov. 8.

Pig Iron—There is little buying and selling and the market has weakened. What iron figures in the transactions now is resale material, and is being sold generally at about $43 for 1.75 to 2.25 silicon grade of foundry. There are reports that some is going for less than this, but these cannot be verified. One maker who sold about 2500 tons last week says the price was "about $45." Another maker insists it is selling nothing lower than $45. Many of the resale transactions are in connection with iron the shipment of which was requested suspended by foundries engaged in making automobile parts or allied industries. Furnaces look for an extended lull.

We quote f.o.b. Buffalo, as follows:

No. 1 foundry, 2.75 to 3.25 sil.	$45.25 to $48.25
No. 2 X foundry, 2.25 to 2.75 sil.	43.50 to 44.50
No. 2 plain, 1.75 to 2.25 sil.	42.25 to 43.25
Basic	38.00
Malleable	42.00
Lake Superior charcoal	58.00

Finished Iron and Steel—Business is still hesitant with little new inquiry and few orders. Mills are trying to work out tonnage now on their books. There have been no price changes, except that material has settled to a general level nearer the 3c. basis than before. A waiting attitude is being preserved by customers and mills and it looks as if this will extend over the rest of the year. The real test will come, mill interests believe, after the first of the year. The Steel Corporation prices are below the level of many independents' operating expenses, and the idea is advanced that some mills may find it cheaper to close than to operate. That will take out production and be equivalent to an increase in demand. The market for bars now stands at about 3.25c. Pittsburgh. There has been some 3c. business taken, but 3.25c. is the regular price. Shapes are firm at 3.10c. and plates at 3.25c., though it is understood that concessions to 3c. have been made on business by mills outside this territory. Mill operation is close to normal here, with wire mills in steady heavy production. One plate mill has been closed, but so far as can be learned this is the only shut-down. There have been some requests for cancellation, but mills are adhering to a policy of no cancellation. Some requests for extended shipments have been granted. Shipments are good. Bids are being taken for the new Hotel Statler, Buffalo. About 7000 tons of structural steel will be required.

Warehouse prices f.o.b. Buffalo are: Steel bars, 4.65c.; shapes, 4.15c.; plates, 4.30c.; No. 10 blue annealed sheets, 7.15c.; No. 28 black sheets, 8.50c.; No. 28 galvanized sheets, 10.60c.; hoops, 6.60c.

Old Material—Dullness still characterizes the market, with sales limited to those made by dealers. This element entering the situation operates to keep prices from slipping more rapidly. There has been no further drop in prices from last week, but there is no further business in sight, and indications are that the bottom has not been reached. Mill stocks generally are not large, but it is believed they are fairly well covered for some weeks, and as some mills have been reduced to one shift and some others have been closed altogether, there is little prospect that the old material market will pick up for some little time.

We quote dealers' asking prices per gross ton, f.o.b. Buffalo as follows:

Heavy melting steel, regular grades	$23.00 to $24.00
Hydraulic compressed	20.00 to 21.00
Low phos., 0.04 and under	32.00 to 32.50
No. 1 railroad wrought	30.00 to 31.00
No. 1 machinery cast	37.00 to 38.00
Iron and steel axles	36.00 to 37.00
Car wheels	37.00 to 38.00
Railroad malleable	29.00 to 30.00
Machine-shop turnings	13.50 to 14.50
Heavy axle turnings	18.50 to 19.50
Clean cast borings	17.50 to 18.00
Iron rails	31.00 to 32.00
Locomotive grate bars	22.00 to 23.00
Stove plate	28.00 to 29.00
Wrought pipe	18.00 to 19.00
No. 1 busheling	19.00 to 20.00
Bundled sheet stampings	15.00 to 15.50

Cincinnati

CINCINNATI, Nov. 8.

Pig Iron.—Actual sales of pig iron during the past week were very few and altogether for small lots, the largest reported being 150 tons of Southern iron. Two fair sized inquiries for early shipments are before the trade, one for 2000 tons of foundry iron from a melter in this district, and one for 1000 tons of malleable from an Illinois melter. On the former inquiry, it is reported that Southern iron was quoted from $38 to $42, the lower price said to be on resale iron. It is understood that the purchase will be delayed for a few days. One furnace in this district has made a quotation of $45.50, furnace, on the Illinois inquiry, but does not expect to secure the business. A producer of basic iron in this district has offered a considerable tonnage to a steel maker at $37, furnace. While this quotation was $6 below last week's nominal level, the offer was not accepted, as the steel maker considers even this price too high. This interest during the past 10 days purchased a round tonnage of basic at a price reported to be in the neighborhood of $32.50, but whether this was resale iron or furnace iron, the buyer would not state. Northern iron is quiet, and furnaces are holding at $45 to $46. On an attractive tonnage, it is said that this price can be shaded considerably. Northern resale iron is available in fairly large tonnages at $42.50, with smaller lots going from $38 up. Southern iron for resale is offered at $38 and $39, an offering of 500 tons at the former figures going begging. A local broker is reported, however, to have purchased 500 tons at this figure. In last week's market report, it was stated, that a 10,000 ton inquiry was before the trade from a Springfield, Ohio, melter. This was a telegraphic error, the inquiry being for 1000 tons.

Based on freight rates of $4.50 from Birmingham and $2.52 from Ironton, we quote f.o.b. Cincinnati:

Southern coke, sil. 1.75 to 2.25 (base price)	$42.50 to $46.50
Southern coke, sil. 2.25 to 2.75 (No. 2 soft)	43.75 to 47.75
Ohio silvery, 8 per cent sil	60.52
Southern Ohio coke, sil. 1.75 to 2.25 (No. 2)	47.52
Basic northern	39.52
Malleable (nominal)	48.02

Finished Material.—Some sellers report a little better inquiry for finished materials during the week, but that these were generally for small tonnages. Steel bars, wire products, and small spikes are in moderate demand, and some sales are reported. The general quotation for steel bars is 3.25c., Pittsburgh, and sales are being made at this price. The sheet market is extremely dull, buyers holding off in the expectation of lower prices. Mills in this district are comfortably fixed for orders for the remainder of this year, and are operating up to their capacity. To date none of them has opened its books for first quarter. Talk of lower prices are heard, and it is reported that a consumer in this territory bought 400 tons of black sheets at 5.75c. This was a very desirable specification, the entire tonnage calling for the same size and gage. Plate and structural business is very quiet. The American Bridge Co. has been awarded two girder spans amounting to 200 tons by the Big Four Railroad, and the Bethlehem Steel Co. 80 tons from the same interest. The McClintic-Marshall Co. has taken the steel for a substation for the Columbus Ry. & Power Co. amounting to about 100 tons. Warehouse business is quieting down perceptibly, and orders received call for small lots for immediate needs. No price changes are reported, jobbers quoting from warehouse:

Steel bars, 4c. base; shapes, ¼-in. and heavier, 4.10c.; plates, 4.50c.; cold rolled rounds, 1½-in. and over, 6.25c.; cold rolled rounds, under 1½-in., and flats, squares and hexagons, 7c. base; steel bands, 6c. base; No. 10 blue annealed sheets, 7c. base; Nos. 14 and 16 blue annealed sheets, 7½c. base; black sheets, 28-gage, 8c.; galvanized sheets, 28-gage, 9c.; wire nails, $4.50 per keg base.

Coke.—The coke market is quiet. Connellsville furnace coke is offered from $9.50 to $10.50, with foundry at $11.50. Wise County furnace coke is quoted at $10 and foundry $13 to $15. Sales of New River foundry coke, aggregating 300 tons, have been made at $15, ovens.

Old Material.—The scrap market is extremely dull and weaker. Dealers are confining their efforts to filling old contracts, and are experiencing some difficulty in securing shipping permits. Very few transactions are reported, and these are on a lower basis. Steel mills in this district are contemplating reducing operations and are not now in the market for scrap. Dealers generally have reduced their buying prices on such items as rerolling rails, car wheels, railroad wrought, railroad cast, locomotive tires and malleable cast $2. Borings and turnings also are down $1 a ton.

We quote dealers' buying prices:

Per Gross Ton	
Bundled sheets	$10.50 to $11.50
Old iron rails	23.50 to 24.50
Relaying rails, 50 lb. and up	47.50 to 48.50
Rerolling steel rails	26.50 to 27.50
Heavy melting steel	17.50 to 18.50
Steel rails for melting	19.50 to 20.50
Car wheels	31.50 to 32.50
Per Net Ton	
No. 1 railroad wrought	18.50 to 19.50
Cast borings	8.50 to 9.00
Steel turnings	7.00 to 7.50
Railroad cast	23.50 to 24.50
No. 1 machinery	26.50 to 27.50
Burnt scrap	19.50 to 20.50
Iron axles	32.00 to 32.50
Locomotive tires (smooth inside)	18.00 to 19.00
Pipes and flues	11.50 to 12.00
Malleable cast	19.50 to 20.00
Railroad tank and sheet	11.50 to 12.00

Birmingham

BIRMINGHAM, ALA., Nov. 9.

Pig Iron.—In spite of the Steel Corporation's set and announced level of $38 for first half of 1921 and the booking of a ten-day run on foundry by the Gulf States Steel Co., at the same base, the regular independent merchant foundry producers say they have not changed their price up to the close of the week. They will not do so as long as they can keep away from it on account of the large amount of iron billed on the $42 level, much of which runs well into the first quarter of 1921 and some into the first half. They claim that the spot business that is done by the merchant furnaces is on the basis of $42. A car lot of 1.75 to 2.25 silicon brought $42 and one of 2.75 to 3.25 brought $45. The larger foundry interests report no bookings of higher than 100-ton lots, but one interest received an inquiry during the week for 2000 tons and another for 800 tons for Middle Western delivery. The price quoted was $42 base. Part of the $38 iron sold by the Gulf States Steel Co. went to a Southern pipe maker and part to the Middle East. The leading interest is disposing of its $38 iron chiefly to large pipe works which take a number of grades not easily disposed of otherwise. One New York exporting house, which ordered 2000 tons for last quarter delivery some time ago at $42, faces a loss if the order is billed for export and has been trying to take a smaller loss by selling in this country. It has been offered under the market and was feeling for takers during the week. This is the only actual resale iron in the South that has been spotted, and it has not yet been manufactured. It is in no wise certain that the Gulf States Steel Co. will have any more foundry to offer, but it is equally true that it may have some. The Sheffield Iron Corporation is scheduled to resume during the week. The Alabama Co. announces the installation of a Heyl & Patterson pig casting machine at the Gadsden furnace plant.

We quote per gross ton f.o.b. Birmingham district furnaces, the Tennessee company included, as follows:

Foundry, sil. 1.75 to 2.25	$38.00 to $42.00
Basic	38.00 to 41.00
Charcoal	60.00

Cast Iron Pipe.—The United States Cast Iron Pipe & Foundry Co. has finally closed with the water and sewerage board of New Orleans for 8400 tons of pipe from 6 to 42 in. All the plants of the leading interest are fairly busy, but there is little new business coming in. Knoxville and Macon, Ga., placed small orders. It is stated that almost one half of the sanitary shops have closed and the other half operating from 50 per cent up. There are reports of price shading. Molders in the Anniston district have remained at work under a 15 per cent wage cut under protest.

Coal and Coke.—Coke is much easier, and the new prices announced a week ago are the maximum. There is no disposition, however, to cut under the market. Contracts are at $12.50 base and spot $14 base. Furnace coke is obtainable at $10. Coal production reached 284,000 tons last week. This compares with a normal of 300,000. The coal strike hangs on, but production has reached a point that obviates all uneasiness. In fact, spot coal has dropped to the level of contracts. Export coal is nil for the time being.

Old Material.—The scrap market could not be more dull. There is little or no attempt at real transactions. The prices quoted are nominal. Concessions are not offered, because it is not believed they would produce business.

We quote per gross ton f.o.b. Birmingham district yards, prices to consumers, as follows:

Old steel rails	$19.00 to $20.00
Heavy melting steel	18.00 to 19.00
No. 1 cast	30.00 to 32.00
Car wheels	29.00 to 31.00
Tram car wheels	28.00 to 30.00
No. 1 wrought	19.00 to 20.00
Stove plate	20.00 to 21.00
Cast iron borings	9.00 to 10.00
Machine shop turnings	9.00 to 10.00

New York

NEW YORK, Nov. 9.

Pig Iron.—Some foundries which have been long operating with an insufficient number of molders have been able to employ additional men on account of the easing up of the labor situation and are now turning out more castings than for some time. These foundries are taking all the iron that is coming to them and in some cases are urging shipments. For the most part, however, foundries have more iron than they can use and the reselling continues. There is relatively little of eastern Pennsylvania iron for sale, but there is plenty of Alabama and Buffalo iron on the market. On Alabama iron, $38 is the usual quotation for No. 2 foundry at furnace, but reports of lower prices are current. In the case of Buffalo iron, the prevailing quotation seems to be from $42 to $43, but the opinion is expressed that $40, furnace, could be done. In eastern Pennsylvania the usual quotations are based on $43.50, furnace, for No. 2 plain. The sellers are viewing with satisfaction the recent blowing out of blast furnaces and believe that this will have a tendency to stop the downward trend and perhaps hasten the day when demand will be as great as supply. At the present time there is no interest in furnace iron, as it is known that furnaces are not willing to quote prices that can compete with those made on resale iron.

We quote for delivery in the New York district as follows, adding to furnace prices $2.52 freight from eastern Pennsylvania, $5.46 from Buffalo and $6.16 from Virginia:

East. Pa., No. 1 fdy., sil. 2.75 to 3.25	$47.52 to $50.52
East. Pa., No. 2X fdy., sil. 2.25 to 2.75	45.77 to 48.77
East Pa., No. 2 fdy., sil. 1.75 to 2.25	44.52 to 47.52
Buffalo, sil. 1.75 to 2.25	47.46 to 48.46
No. 2 Virginia, sil. 1.75 to 2.25	49.16 to 50.16

Ferroalloys.—There is no inquiry for either ferromanganese or spiegeleisen and quotations are nominal on a basis of $170, seaboard, by both British and American producers. Some resale ferromanganese is still available on a basis of $155, seaboard, but no further sales are reported. The higher grade of spiegeleisen is nominally quoted at $75, furnace, with resale metal available at substantial concessions from this level. There have been no sales recorded. An interesting development is the importation to Great Britain in September of 500 to 600 tons of silico-manganese from Italy. A small amount of this has found its way to the United States from England. High grade manganese ore is inactive and nominal at 45c. to 50c. per unit, seaboard. The 50 per cent ferrosilicon market is very quiet at $80 to $85 per ton, delivered.

Finished Iron and Steel.—Prices are substantially nominal, with 3c. a ready possibility on plates, shapes or bars on an attractive order for early delivery. It remains that many mills are still quoting higher prices, but admit a willingness on a firm, attractive order to shade the 3c. level. A lot of 200 tons of plates for export brought quotations of 2.95c. and 2.90c. and was closed at 2.75c., Pittsburgh, by a Western mill. Cancellations appear to be numerous, but mills are refusing to accept them where concerns are clearly solvent, and a crop of lawsuits is expected to result. The railroads of the East have apparently closed for all their 1921 rail requirements. The business has been placed chiefly with two independent rail makers and the Steel Corporation and practically in all cases on the basis of a price to be named later. One exception appears to be a relatively small tonnage definitely sold at $62.50, as noted three weeks ago, and indications are that the independent mills will hold out for a price of $62 to $63. Many in the trade express the belief that the promulgation of its price policy for 1921 by the Steel Corporation would have a salutary effect on business, which is clearly a waiting one. Meanwhile, an increase in warehouse business is looked for on the score that buyers will buy from hand to mouth until mill prices are well defined. New business in bolts and nuts is lacking, but Eastern makers have not been dependent on the automobile trade, and few if any requests for cancellations have been made, and the movement of material to consumers is proceeding orderly. Difficulty in getting cars, owing to the coal regulations, is still a factor on delaying movements from mills. Probably 10,000 cars are under active negotiation, with the Louisville & Nashville for 2000 hopper cars and the Southern Railway for 2500 box cars the latest to enter the market. The structural steel market is exceedingly quiet, there being very few calls for bids on construction work. The Standard Oil Co. is in the market for 2000 tons for an office building in Baltimore; the New York Telephone Co. wants 600 tons for an exchange at Coney Island and the Atlantic Coast Line is inquiring for 150 tons of fabricated steel. No jobs of importance have been let.

We quote for mill shipments, New York, as follows: Soft steel bars, 2.73c. to 3.38c.; plates, 3.03c. to 3.38c.; shapes, 2.83c. to 3.38c.; bar iron, flats, wider than 6 in., 5.38c., with half extras; light rounds, squares and flats, 5.88c., with full extras, and other sizes, 4.88c., with half extras.

High-Speed Steel.—The price of $1.25 per lb. for 18 per cent tungsten high-speed steel, which producers continue to quote, is nominal. There is practically no market of high-speed steel to-day and prices depend largely upon the conditions of each sale.

Cast Iron Pipe.—Chief interest centers in the possibility of a reduction in prices of pipe. It is understood that prices were discussed informally by several manufacturers of pipe in the East early this week, but no immediate change was contemplated. At any rate, such a revision is expected before Jan. 1. An award of 250 tons of 12-in. pipe for the city of New York was made to the Paladino Construction Co., which will furnish materials and lay the pipe. Manufacturers are still comfortably filled with orders. We quote, f.o.b. New York, 6 in. and larger, $77.22; 4 in., $87.22; 3 in., $97.22, with $2 additional for Class A and gas pipe.

Warehouse Business.—A very light business is being done by most warehouses. Several dealers have received practically all back orders with mills. There may be a downward revision of sheet prices when low priced sheets now being rolled by mills are received. Warehouses here have reduced the base price on soft steel bars from 4.75c. per lb. to 4.50c. per lb. Hoops and bands have dropped from 7c. to 6c. per lb. and refined iron bars are being quoted at 5c. base, a reduction of 50c. per 100 lb. These changes will be noted on "Current Metals" page next week. Tin plates, primes and wasters have dropped off $1, which has been noted on page 1314.

Old Material.—There has been almost an absence of sales during the past week. Even buying to fill old orders is practically at an end. The prices quoted below, therefore, represent more the prices of a week or so ago when sales were made than now, when there is but little testing of the market. Though prices may go lower, dealers say they cannot reach pre-war prices, pointing to the one item of labor alone; they say it cost $2 a ton to manufacture scrap then, whereas now it costs about $7. A little heavy melting steel for delivery

to Monessen was transacted at $23, delivered. No. 1 machinery cast, when bought, changes hands at approximately $35, shipping point.

Buying prices per gross ton, New York, follow:

Heavy melting steel	$17.00 to $18.00
Rerolling rails	29.50 to 30.00
Relaying rails, nominal	55.00 to 56.00
Steel car axles	23.00 to 24.00
Iron car axles	43.00 to 44.00
No. 1 railroad wrought	22.50 to 23.00
Wrought iron track	18.50 to 19.00
Forge fire	10.00 to 11.00
No. 1 yard wrought long	19.00 to 20.00
Light iron	7.00 to 8.00
Cast borings (clean)	16.50 to 17.00
Machine-shop turnings	12.50 to 13.00
Mixed borings and turnings	12.00 to 12.50
Iron and steel pipe (1 in. diam. not under 2 ft. long)	15.50 to 16.50
Stove plate	22.50 to 23.00
Locomotive grate bars	23.00 to 24.00
Malleable cast (railroad)	22.00 to 23.00
Old car wheels	35.00 to 36.00

Prices which dealers in New York and Brooklyn are quoting to local foundries, per gross ton:

No. 1 machinery cast	$37.00 to $37.50
No. 1 heavy cast (columns, building materials, etc.), cupola size	36.00 to 37.00
No. 1 heavy cast, not cupola size	27.00 to 28.00
No. 2 cast (radiators, cast boilers, etc.)	27.00 to 28.00

Cleveland

CLEVELAND, Nov. 9.

Iron Ore.—Ore shipments are beginning to fall off. Starting with Sunday, the Pittsburgh Steamship Co. began to lay up its barges as fast as they reached Lake Erie ports, and many of these will be out of commission by the end of the week. The steamers of the Pittsburgh Steamship Co.'s fleet and most of the vessels carrying ore for independent interests will continue to operate until the end of the month. Ore firms, generally, are now in good shape on their contracts and with fair weather conditions they will be well cleaned up with shipments on contracts by Dec. 1. There appears to be no reason for changing recent estimates that ore shipments of the season will be about 57,000,000 tons. The lake movement until Nov. 1 was 53,122,342 gross tons, a gain of 9,143,928 tons over the same period last year. Shipments during October were 8,848,986 tons, or only slightly less than in September, when they amounted to 8,923,482 tons. However, the October movement shows a gain of 2,647,103 tons over the same month a year ago.

Lake Erie dock stocks increased nearly 1,000,000 tons during October, the amount on docks Nov. 1 being 10,212,975 gross tons as compared with 10,400,767 tons on the same date a year ago. Receipts at Lake Erie ports last month were 7,175,718 tons and for the season until Nov. 1, 39,134,919 tons, as compared with 34,043,434 tons during the same period last year. Shipments from these docks until Nov. 1 were 29,277,387 tons as compared with 23,508,602 tons till Nov. 1 last year. Receipts at other than Lake Erie ports till Nov. 1 were 12,137,007 tons, as compared with 8,637,303 tons during the same period last year.

We quote delivered lower lake ports: Old range Bessemer, $7.45; old range non-Bessemer, $6.70; Mesaba Bessemer, $7.20; Mesaba non-Bessemer, $6.55.

Coke.—Prices have continued their downward trend. A Cleveland consumer late in the week purchased 35 cars of standard Connellsville furnace coke at $9, but since then $8.50 quotations have appeared. Sales of prompt shipment foundry coke are reported at $10 to $10.50. We quote this grade at $10 to $11.

Pig Iron.—The market was never duller than at present and sellers generally do not have well-defined ideas as to what present prices are, particularly on foundry grades. Resale iron is dominating the market. There are numerous small lots of this iron in foundry grades for which owners are trying to get the best prices possible. While the quantity of resale iron may not be large, it is in excess of the demand and some of the furnace companies are inclined to wait until this iron is absorbed before naming lower prices, feeling that whatever price they quote, a lower price will be named on resale iron. Consequently, some producers are making as nominal quotation the former ruling price of $47 on foundry iron. The Valley furnace price on this grade declined $1 per ton during the week on a small lot sale of No. 2 iron at $44. Quotations on foundry iron range from $42 to $44, but resale iron can probably be bought at around $40. One southern Ohio producer is asking for offers on early shipment foundry iron. The only new inquiry of any size is for 500 tons of malleable iron from an Illinois car builder. There is no activity in Bessemer and basic grades. A few small lot sales of low phosphorous iron are reported, all in resale iron at somewhat under furnace prices. Furnace stock piles are growing as a result of suspension of shipments and absence of new orders. One of the Detroit furnaces is scheduled to go out of blast this week and other Central Western furnaces are likely to be blown out before the end of the month.

We quote delivered Cleveland as follows, based on the new freight rates, these being a 56c. switching charge for local iron, a $1.96 freight rate from Valley points, a $3.36 rate from Jackson and $6.67 from Birmingham:

Basic	$40.46
Northern No. 2 fdy., sil. 1.75 to 2.25	43.96 to 45.96
Southern fdy., 2.25 to 2.75	45.92 to 49.92
Ohio silvery, sil. 8 per cent	61.36 to 63.36
Standard low phos., Valley furnace	54.00 to 56.00

Finished Iron and Steel.—Prices quoted by independent mills continue to show a downward tendency. Demand is light. Buyers generally are placing orders for small lots of steel to cover early requirements only. Steel bars, which have been held at 3c. to 3.25c. for a few weeks, are now quite generally established at the lower price, although sales of miscellaneous small lots are still being made at 3.25c.. Plates are easier. While most independent mills are declining to quote below 3c., a Cleveland mill has booked several orders aggregating 2500 tons at 2.95c. and has quoted 2.90c. on a 3000-ton lot. Tank shops are endeavoring to place several lots of plates aggregating 6000 tons at 2.75c. These are understood to have a contract with the Steel Corporation, but are willing to pay $2 a ton above the Steel Corporation's price to get earlier deliveries. A leading independent mill has reduced prices $2 a ton on structural material to 3c. Hard steel reinforcing bars are weak and have further declined to 3.25c. Sales of large round hard steel bars, rolled from shell steel, are being made to agricultural implement manufacturers at 3c., or $5 a ton reduction from recent prices.

Cleveland warehouses quote steel bars at 3.34c. to 3.84c.; plates, 3.64c. and structural material, 3.44c.; No. 9 galvanized wire, 4.70c.; No. 9 annealed wire, 4c.; No. 28 black sheets, 8c. to 8.50c.; No. 28 galvanized, 9c. to 9.50c.; No. 10 blue annealed, 6.50c. to 6.75c.

Bolts, Nuts and Rivets.—Manufacturers are still busy on old contracts and have enough orders on their books to keep them busy for from two to four months. New business is very light, being limited to small lots for early needs. Bolt and nut prices are steady, with about a 2½ per cent spread between high and low quotations. Manufacturers are inclined to hold to ruling prices at present, but it is expected that when new buying starts up in any volume there will be lower prices.

Small machine bolts, rolled threads, 25 to 10 per cent off list; same sizes in cut threads, 25 per cent off list; larger and longer sizes, 25 per cent off list; carriage bolts, smaller and shorter, rolled threads, 20 and 10 per cent off; cut threads and larger and longer sizes, 20 per cent off list; lag bolts, 40 per cent off list; plow bolts, Nos. 1, 2 and 3 head, 25 per cent off list, the 20 per cent extra for other style heads being unchanged; machine bolts, both smaller and shorter, and larger and longer sizes, 10 per cent off list; hot pressed sq. and hex. blank nuts, 50c. off list; tapped nuts, list; cold pressed sq. and hex. blank nuts, list plus $1; semi-finished hex. nuts, 40 per cent off list.

Sheets.—The demand for sheets is light and some of the mills badly in need of orders are willing to make considerable price concessions. The Riverside works of the Otis Steel Co. is shut down this week. Independent mills quote blue annealed sheets at 4.50c. to 5c. Prices on Nos. 8 to 12 gages in tank steel are lower. Those now being quoted by one mill are on the 3c. plate basis, or 3.60c. for No. 10, this price being a decline of $6 a ton during the week. Box annealed sheets are quoted at 5.50c. to 6c., and galvanized sheets at 7.50c. to 8c. for No. 28. Mills have not yet named prices for automobile body sheets for the first quarter, and the quotation on these remains nominal at 7.85c.

Warehouse Business.—Warehouses now have good stocks, but report sales light. Recent warehouse prices on sheets are being shaded $10 a ton and a local jobber has reduced prices on automobile body sheets to 8.85c., base. Other warehouse prices are unchanged.

Old Material.—Activity in the scrap market appears to be growing less from day to day as dealers reduce the tonnage due on unfilled orders. A few sales are reported to cover on old contracts, but some of the dealers are getting well cleaned up on their old orders. None of the mills is in the market and little buying is expected by consumers before the first of the year. Offerings do not indicate that there is a surplus of scrap, as production has apparently fallen off as much as the demand. The market continues rather weak. Steel rails have declined about $1 a ton and iron rails are quoted $2 a ton lower. In the absence of sales, quotations on many grades are nominal.

Dealers quote delivered consumers yards in Cleveland and vicinity, as follows:

Heavy melting steel	$24.00 to $24.50
Steel rails, under 3 ft	26.00 to 27.00
Steel rails rerolling	32.00 to 33.00
Iron rails	29.00 to 30.00
Iron car axles	41.00 to 42.00
Low phos. melting scrap	26.00 to 27.00
Cast borings	16.00 to 16.50
Machine shop turnings	11.75 to 12.00
Mixed borings and short turnings	16.00 to 16.50
Short turnings for blast furnaces	16.00 to 16.50
Compressed steel	20.50 to 21.50
Railroad wrought	26.00 to 26.50
Railroad malleable	30.50 to 31.00
Steel axle turnings	21.00 to 21.50
Light bundled sheet stampings	13.00 to 13.50
Drop forge flashings over 10 in	17.50 to 18.00
Drop forge flashings under 10 in	17.50 to 18.00
No. 1 cast	30.00 to 32.00
No. 1 busheling	17.00 to 17.50
Railroad grate bars	28.00 to 29.00
Stove plate	27.50 to 28.00
Cast-iron wheels	39.00 to 40.00
Pipes and flues	22.00 to 22.50

Philadelphia

PHILADELPHIA, Nov. 9.

Independent makers of plates, shapes and bars have evidently decided to make a decided stand at the 3c. price level against further reductions. Much is heard about closing down plants rather than making further price concessions at this time. In fact, a plate mill of one large company has closed down for a week, at least. The open-hearth department of the same company closed Monday, having four weeks' supply of ingots in stock. Some plants making finished steel are working at less than 50 per cent of capacity.

A decline of $1 a ton is noted the past week in quoted prices on foundry iron and an actual drop, as measured by a sale, in basic, of $2. Most of the resale iron is that which was contracted for in New England. The lowest resale price reported is $40.75, base, Buffalo furnace.

Sellers generally agree that this is the dullest period in many months. What buying takes place is on a hand-to-mouth basis. Cancellation requests come in very unequally, some sellers having no requests, others having many. Generally the buyer must present a very plausible reason for desiring to cancel, other than the expectancy of lower prices. Cancellation requests are more rife in finished material than in raw material.

Pig Iron.—Foundry iron is now obtainable from eastern Pennsylvania and Virginia furnaces at $45, base, though no sales are noted. Basic iron has been sold at $43, eastern Pennsylvania furnace, by an Eastern steel company. The lowest price noted on resale foundry iron is $40.75, Buffalo furnace. A Bridgeport, Conn., manufacturer has been disposing of some foundry iron from a lot of 2700 tons at the price at which he contracted for it, namely, $41, base, some being taken in this district. An eastern Pennsylvania manufacturer in the automotive line has been disposing of about 2000 tons of foundry, malleable and charcoal grades in small lots and with the help of several brokers. What little resale iron is being offered in this district was, in 75 per cent of the cases, originally contracted for in New England in quantities large enough to take care of possible winter tie-ups. Iron from Buffalo furnaces figures in resale transactions more than iron from other districts. There is a total of about 20,000 tons of iron piled at eastern Pennsylvania furnaces, whereas 100,000 tons is a normal quantity. Requests for cancellations are not as frequent as in finished steel lines. As a typical instance, a seller with 26,000 tons of orders on his books has requests from four buyers for cancellations totaling 1000 tons, but the seller considers but one of these buyers as having a legitimate excuse. A Southern railroad has inquired for 250 tons of foundry, but it is expected that the order will be placed with a Southern furnace. Some sellers profess to see a trifle better demand since election, saying that foundries which previously ordered suspensions of shipment have been urging prompt shipment since Nov. 2; a few more fresh inquiries in small tonnages have also developed.

The following quotations are for iron delivered in consumers' yards in Philadelphia or vicinity, except those for low phosphorus iron, which are f.o.b. furnace.

East. Pa. No. 2 plain, 1.75 to 2.25	$46.54 to $48.54
East. Pa. No. 2X, 2.25 to 2.75 sil.	47.79 to 49.79
Virginia No. 2 plain, 1.75 to 2.25 sil.	50.74 to 51.74
Virginia No. 2X, 2.25 to 2.75 sil.	51.99 to 52.99
Basic deliv. Eastern Pa.	44.46 to 44.54
Gray forge	46.16
Standard low phos. (f.o.b. furnace)	60.00
Malleable	51.50 to 52.40
Copper bearing low phos. (f.o.b. furnace)	57.00

Ferroalloys.—There are rumors of resale spiegeleisen changing hands at $65 and $70, though $80 is the nominal furnace price. Resale ferromanganese is generally quoted at $150; by the makers, $170, c.i.f. Atlantic seaboard.

Semi-Finished Steel.—Though no sales have been made for some time, $55 for rerolling billets and $65, Pittsburgh, for forging billets are uniformly quoted. Wire rods are nominally $75, Pittsburgh.

Finished Steel.—Though plates, shapes and bars are admittedly obtainable at 3c., no prices lower than this are reported by sellers, though buyers maintain to sellers that competitors have offered at lower levels. There are enough sales of small tonnages to establish the 3c. price on these three commodities, such as a recent sale of 200 tons of bars and the tonnage of plates to the Pennsylvania Railroad, reported last week. Bars generally are quoted from 3c. to 3.25c., Pittsburgh. The Norfolk & Western is asking for 1000 freight cars, which inquiry may result in plate business.

Old Material.—A decline of about $1 a ton has affected several items, one of these being heavy melting steel, an eastern Pennsylvania mill having purchased some at $20, delivered, and offers $18 for the next it buys. The Phoenix Iron Co. has bought about 1000 tons of bundled skeleton at $16, delivered. There is practically no new business, and most buying on old orders will have been completed by the week's end. Price declines have also affected low phosphorus borings, turnings and No. 1 cast.

No. 1 heavy melting steel	$20.00 to $21.00
Steel rails, rerolling	34.00 to 35.00
No. 1 low phos., heavy 0.04 and under	31.00 to 32.00
Car wheels	39.00 to 40.00
No. 1 railroad wrought	26.00 to 27.00
No. 1 yard wrought	24.50 to 25.50
No. 1 forge fire	14.50 to 16.00
Bundled skeleton	15.50 to 16.00
No. 1 busheling	20.00 to 21.00
No. 2 busheling	17.00 to 18.00
Turnings (short shoveling grade for blast furnace use)	17.00 to 18.00
Mixed borings and turnings (for blast furnace use)	15.00 to 16.00
Machine-shop turnings (for rolling mill and steel works use)	16.50 to 17.50
Heavy axle turnings (or equivalent)	20.00 to 21.00
Cast borings (for rolling mills)	21.00 to 22.00
Cast borings (for chemical plants)	23.00 to 24.00
No. 1 cast	36.00 to 37.00
Railroad grate bars	28.00 to 29.00
Stove plate (for steel plant use)	25.00 to 26.00
Railroad malleable	27.50 to 28.50
Wrought iron and soft steel pipes and tubes (new specifications)	20.00 to 21.00
Iron car axles	35.00 to 37.00
Steel car axles	35.00 to 37.00

St. Louis

ST. LOUIS, Nov. 9.

Pig Iron.—Aside from an inquiry for 1000 to 2000 tons of carwheel iron, either charcoal or coke, the week was without any feature as regards buying of pig iron. The furnace representatives reported that local melters were taking all that came forward on their contracts and were apparently using it, as there was practically no disposition to ask that shipments be held up. As to price, no change is reported and representatives say that with the steady reduction of furnace capacity reported, there is little or no likelihood that there will be any reduction.

Coke.—The coke market continues to soften with prices ranging from $11 to $15 oven for best selected 72-hr. coke, although the lower price is not frequently found. For prompt shipment coke the range is from $13 to $15 per ton, with $15 per ton asked for deliveries in 1920. No by-product prices are being made at present here and there is none available from the local furnace.

Finished Iron and Steel.—In finished products the week has been very quiet with no developments in the contracting division worth mentioning.

We quote for stock out of warehouse as follows: Soft steel bars, 4.07½c.; iron bars, 4.50c.; structural material, 4.17½c.; tank plates, 4.37½c.; No. 10 blue annealed sheets, 7.27½c.; No. 28 black sheets, cold rolled, one pass, 8.20c.; No. 28 galvanized, black sheet gage, 9.70c.

Old Material.—The scrap market weakened very rapidly last week, following the movement begun before election day and the only business that appeared was entirely a matter of trading among dealers to get material to deliver on contracts about to expire. Severe cuts were reported, but even with these there was no real business stirring. The lists out included 1,600 tons from the Wabash, 900 tons from the Mobile and Ohio and 2,700 tons from the Pennsylvania. All these close during the present week.

We quote dealers' prices, f.o.b. consumers' works, St. Louis industrial district, as follows:

Per Gross Ton	
Old iron rails	$28.00 to $28.50
Old steel rails, rerolling	27.00 to 27.50
Old steel rails, less than 3 feet	18.50 to 19.00
Relaying rails, standard section, subject to inspection	40.00 to 45.00
Old car wheels	32.00 to 32.50
No. 1 railroad heavy melting steel scrap	17.00 to 17.50
Heavy shoveling steel	16.50 to 17.00
Ordinary shoveling steel	16.00 to 16.50
Frogs, switches and guards cut apart	17.50 to 18.00
Ordinary bundled sheet	10.50 to 11.00
Per Net Ton	
Heavy axle and tire turnings	10.50 to 11.00
Iron angle bars	26.00 to 26.50
Steel angle bars	17.00 to 17.50
Iron car axles	37.00 to 37.50
Steel car axles	27.00 to 27.50
Wrought arch bars and transoms	29.00 to 29.50
No. 1 railroad wrought	18.50 to 19.00
No. 2 railroad wrought	17.50 to 18.00
Railroad springs	17.00 to 17.50
Steel couplers and knuckles	17.00 to 17.50
Locomotive tires, 42 inches and over, smooth inside	16.00 to 16.50
No. 1 dealers' forge	15.00 to 15.50
Cast iron borings	9.00 to 9.50
No. 1 busheling	17.00 to 17.50
No. 1 boilers, cut to sheets and rings	12.50 to 13.00
No. 1 railroad cast scrap	26.00 to 26.50
Stove plate and light cast scrap	19.00 to 19.50
Railroad malleable	18.00 to 18.50
Agricultural malleable	17.00 to 17.50
Pipes and flues	13.00 to 13.50
Railroad sheet and tank scrap	11.00 to 11.50
Railroad grate bars	16.00 to 16.50
Machine shop turnings	7.00 to 7.50
Country mixed scrap	12.50 to 13.00
Uncut railroad mixed scrap	11.00 to 11.50
Horseshoes	21.00 to 21.50
Railroad brake shoes	17.00 to 17.50

Steel Treaters New Headquarters

The new headquarters of the American Society for Steel Treating will be located at 4600 Prospect Avenue, Cleveland, in accordance with the agreement involved in the recent amalgamation. Beginning Nov. 20, all correspondence should be sent to the above address where W. H. Eisenman, executive secretary, will be in charge.

British Iron and Steel Market

Blast Furnaces to Resume Next Week—Semi-finished Steel Weakening—Belgian Iron Competing

(*By cable*)

LONDON, ENGLAND, Nov. 8.

Most of the miners voted against an acceptance of the settlement of the strike, but it has been called off and a general resumption is expected this week. Operation of blast furnaces will not start until next week. In the meantime business is at a standstill, but Cleveland producers hope to resume export business in foundry iron at an early date. They are feeling the keen competition from Continental producers, Belgian pig iron being offered at £11, delivered Scotland. British prices in the meantime are unchanged. Further lots of 500 tons of Belgian basic iron have arrived here.

The position of the steel market is unaltered, but semi-finished steel is weakening. Belgian billets are offered at £14 f.o.b. and bars at £15 f.o.b. Tin plate makers are still waiting for the fixing of a minimum price and asking 45s., basis, for prompt shipment. Merchants have sold at 40s., basis. Sheet bars are officially quoted at £21, but outside sales have been done at £18 10s. and lower prices are talked of. The galvanized sheet market is weak, with the French product offered in France at £34 f.o.b.

A large steel merger in South Wales is imminent including collieries, tin plate, steel and galvanized sheet works with a capital of £3,000,000.

We quote per gross ton except when otherwise stated, f.o.b. maker's works, with American equivalent figured at $3.34 for £1, as follows:

Ship plates	£26	0 to £33	0	$86.84 to	$110.22
Boiler plates	30	0 to 35	0	100.20 to	116.90
Tees	26	10 to 31	0	88.51 to	103.54
Channels	25	15 to 30	5	86.01 to	101.04
Beams	25	10 to 30	0	85.17 to	100.20
Round bars, ¾ to 3 in.	28	0 to 33	0	93.52 to	110.22
Rails, 60 lb. and up	25	0 to 27	0	83.50 to	90.18
Billets	18	0 to 20	0	60.12 to	66.80
Sheet and tin plate bars Welsh	18	0 to 21	0	60.12 to	70.14
Galvanized sheets, 24 g.	35	0 to 36	0	116.90 to	120.24
Black sheets, 24 g. to 26 g.	50	0 to 54	0	167.00 to	180.36
Tin plate base box	2	1½*		6.93	
Steel hoops	34	0		113.56	
Cleveland basic iron	11	15		39.25	
West Coast hematite	15	15		52.61	
Cleveland No. 3 foundry	11	5		37.68	
Ferromanganese	35	0 to 40	0	116.90 to	133.60
Coke	3	2¾		10.48	

*Prompt delivery; forward, 41s. ($6.85).

Industrial Traffic League to Meet

The National Industrial Traffic League will hold its annual meeting at the Waldorf-Astoria Hotel, New York, Nov. 18 and 19. This is the first time the league has met in New York, and it is expected that the convention will be of special interest to New York shippers, because of the many recent changes in rates affecting New York.

The National Industrial Traffic League was organized 13 years ago as a medium through which the commercial and industrial traffic men representing shippers could co-operate in matters of general or mutual interest pertaining to transportation. Its membership is composed of the traffic representatives of industrial plants and commercial organizations and at present numbers approximately 1000 members. It deals only with subjects of general interest, as, for example: Bills of lading; demurrage; classifications, reconsignment and diversion; transportation instrumentalities and other questions relating to transportation which affect shippers' interests.

The league holds three or four meetings of its entire membership each year, at which reports of committees are received, discussed and acted upon. The initiation fee is $10 and the annual dues are fixed by the executive committee.

SURPLUS STEEL

Barde Corporation Acquires Large Tonnage in Shipyards on Pacific Coast

WASHINGTON, Nov. 9.—Surplus steel at shipyards on the Pacific Coast has been purchased from the Shipping Board by the Barde Steel Corporation, New York, and will be resold by that company.

The arrangement is somewhat different from that involving the sale of surplus steel at Eastern yards to the same company. Under the Pacific Coast contract, which has just been signed by Admiral Benson, chairman of the Shipping Board, an appraisal is to be made by Government experts of the surplus steel. The Barde company guarantees the Shipping Board at least 50 per cent of the appraisal amount for the different materials. If the price at which the Barde company sells the steel is not more than 60 per cent of the appraised value, the company retains as its profit the difference between the 50 per cent figure and the sale price. Amounts received in excess of 60 per cent of the appraised value will be divided between the Shipping Board and the company, the former receiving 75 per cent and the latter 25 per cent. The Barde company has given a bond of $1,000,000 to insure the carrying out of the contract.

It is said that the surplus steel and other materials covered in the contract are worth about $15,000,000. The surplus steel at Eastern yards already purchased by the Barde company cost the company nearly $11,000,000, according to estimates made at the time of the sale last winter.

The Barde company pledges itself not to sell any of the Pacific Coast surplus east of the Rocky Mountains and to dispose of all of it within a year. Shipping Board officials had expected it would take three years to get rid of it. The board will be able to dispense with its sales force on the Pacific, 400 employees in that division already having been dropped.

Admiral Benson in commenting upon the deal said he believed it to be the most favorable arrangement possible. Although the surplus has been advertised for sale repeatedly it has been found difficult to dispose of. One bid of something more than $4,000,000 was rejected recently.

It is estimated by the board that it is likely to receive 63c. on every dollar of cost for the surplus under this arrangement.

The arrangement with the Barde company does not involve any vessels or hulls which are for sale on the Pacific Coast.

Record Breaking in the Pittsburgh District

Although in general steel plant operations have been upon a declining scale for several weeks past, a number of records recently have been established in the Pittsburgh district. The October ingot production of the Pittsburgh Steel Co. exceeded that of any 31-day month in the history of the company, and the Edgar Thomson works of the Carnegie Steel Co. broke the world's record for open-hearth steel production in one month for a 14-furnace plant, furnaces of stationary type. These works established 36 new production records during the month, covering all departments, the month being the most remarkable in the matter of new records in the 45 years of its existence. In the open-hearth department 26 records were established, in the foundry five new high records, in the rail mill two, in the Bessemer department two, in the splice bar department one, and the grand total of ingots produced in both Bessemer and open-hearth departments never before was exceeded.

The sintering plant of the Farrell, Pa. works of the Carnegie Steel Co. in October smashed all former monthly high records for production, and also had four new weekly and five new daily high production marks. Two new high record marks were hung up in the plate mills of the Homestead, Pa., works of the company, the 84-in. mill in October turning out 13,732 tons as compared with 13,493 tons, the best previous record, established in March, 1919, while the 110-in. or Liberty mill ran off 22,885 tons as compared with 22,203 tons the previous record production, also in March, 1919.

MORE OPEN TOP CARS

New Order Makes Many Available for Steel Industry—Increased Output of Coal and Coke

WASHINGTON, Nov. 9.—Additional open top cars will be available for the steel industry as a result of an amendment by the Interstate Commerce Commission to its order confining the use of these cars to coal.

Under the latest order, open top cars with sides 42 in. in height, or more, must be used for coal. The order as it has been in effect for several months limited the use of cars with sides 38 in. in height, and more, to coal.

It is the expectation that the change in definition of coal cars will release about 25,000 additional open top cars for use in transporting steel products, building materials, and other commodities which can use this class of equipment.

This amendment of the open top car order follows the substantial improvement in the coal situation which caused the suspension of the lake priority order ten days ago. The open top car order is the only one of the coal priority orders still in effect, and it will probably be suspended entirely not later than Dec. 1. The order applies to all railroads East of the Rocky Mountains, the original order issued early in the summer having applied to the territory between the Atlantic Coast and the Mississippi River, but being extended further west about a month ago.

The order, known as Service Order No. 20, as now amended, reads as follows:

> And provided further, that the phrase "coal cars" as used in this order shall not include or embrace gondola cars with solid (fixed) sides and solid (fixed) flat bottoms, having sides 42 in. or less in height, inside measurement, or cars equipped with racks, or cars which on June 19, 1920, had been definitely retired from service for the transportation of coal and stenciled or tagged for other service.

The amendment to the order was effective at midnight, Nov. 7.

Investigation of Grafting Charge

The Interstate Commerce Commission has ordered an investigation into reports that railroad employees were being bribed to obtain preference in the supply of coal cars. One charge recently made was that car distributors in different parts of the country have been receiving compensation for displacing and placing coal cars and that a system of petty graft involved dumpers and inspectors, conductors of freight trains and coal agents of railroads.

Production of Coal and Coke

The weekly report of the Geological Survey shows that for the fourth successive week production of soft coal during the week ended Oct. 30 continued above the 12,000,000 ton mark. The total output for the week, including lignite and coal made into coke, is estimated at 12,338,000 tons. This was an increase of 97,000 tons over the preceding week, and, except for the week ended Oct. 25, 1919, just before the great coal strike, was the largest production since the armistice. The total establishes a new record for the weekly output during 1920. The average production per working day was 2,056,000 tons. With four weeks consecutively above 12,000,000 tons, it is the longest period on record of sustained output at that rate except during the summer of the war year 1918.

The production of beehive coke showed an increase of 8000 tons over the preceding week, the total during the week ended Oct. 30 being 399,000 tons. Two districts, one embracing Alabama, Tennessee, and Georgia, and the other Virginia and Kentucky, show a further decrease from the preceding week.

HIGHER COSTS

Effect of New Freight Rates and High Priced Fuel—Developments in the Pittsburgh District.

YOUNGSTOWN, OHIO, Nov. 9.—In face of a declining market, costs at the plant of the Youngstown Sheet & Tube Co. increased from $5 to $6 per ton of finished material in October, states President James A. Campbell. This advance is largely attributable to higher freight rates and to high fuel costs. In the meantime, however, fuel has declined to more normal levels and production costs have proportionately dropped. It is the belief that the national election will prove a stabilizing factor in the current market, though it is not likely to stay price reductions. Manufacturers feel that conditions in the industry will gradually right themselves. Meanwhile the lull in buying is being more sharply reflected each week in operations. Six of the 25 blast furnaces in the Mahoning Valley are idle, another probably will be suspended this week, while several of the others are producing more or less irregularly. Steel departments are operating on an average of about 70 per cent. Some of the smaller sheet makers are curtailing their schedules or have stopped their mills altogether. For the past month the Falcon Steel Co. has been operating six of eight units.

Construction of large additions to the DeForest sheet plant of the Republic Iron & Steel Co. is progressing and is affording employment to a large number of workers. This work and the new 600-ton furnace being erected for the Trumbull Steel Co. at Warren represent the most important expansions now under way. A number of companies which plan to proceed with enlargements are holding such projects in abeyance pending the outcome of readjustment in costs.

Fuel Prices Still Sagging

Fuel prices continue to sag, with spot steam coal available at $4.50 mine and by-product from 50c. to $1 per ton higher. Spot furnace coke is obtainable at from $9 to $10. Prevailing coal prices represent a decline of $8 per ton from the market peak and from $5 to $6 on quotations that ruled for weeks, while the new coke price is $12 under the absolute peak and $7 to $8 below the market that prevailed for weeks.

Rumors About Sheet Transactions

In the sheet market the most conspicuous development has been the reported cancellation of an order for 14,000 tons of black sheets by a Detroit manufacturer of containers. Each of the four large independent interests denies that it has taken a reported order of 18,000 tons of black sheets at a price under 5c. mill and the order cannot be traced to any of the smaller makers. In determining current iron and steel prices there has been some confusion because of the growing volume of resales, due to consumers' liquidating raw material inventories at prices below producers' levels, such quotations having been mistaken for manufacturers'. Demand for galvanized sheets is somewhat firmer, with the market spread between 7.75c. and 8.50c., though reports of commitments at 7.25c. are being discussed in sales circles. This compares with a Steel Corporation price of 5.70c. on No. 28 galvanized.

Conditions in Pipe Market

First influences of the readjustment as affecting the pipe market were ascertainable during the past week, when inquiry for oil well casing sagged. This situation has not affected the market in any way, because of the large unfilled tonnage of the two major Valley makers. There is apparently no let-up in demand for line pipe. Cancellations have been of a negligible nature.

In the steel bar market prices are sinking from 3.25c. to 3c., with several interests reporting substantial unfilled tonnage. A number of automobile makers have cancelled light sizes used for rim sections and this has had a depressing influence on the market. Mills which have been catering to the automobile industry are in position to give quickest delivery.

Though some plate tonnage has been booked at 2.85c., the market is nominally at 3c., and while new business is limited, the leading interest professes to see an improvement.

Low Prices on Basic

Lower fuel costs have had an immediate effect on iron prices, sales of basic having been negotiated at $38 to $40. New demand, however, is practically non-existent, aside from forward business on producers' books. Very little iron is being stocked and makers point to a shortage when demand revives, as it is expected to do about the first of the year. Bessemer and malleable grades are quotable at $42. Last week's sales of basic totalled 6500 tons, for delivery over the remainder of the year, at $40, furnace.

OCTOBER STEEL OUTPUT

Ingot Production at the Same Rate as in September

Steel ingot production in the United States continued in October at the rate of September. While October had one more day, there were five Sundays as against four in September. The statistics just published by the American Iron and Steel Institute show that 30 companies which made 85.12 per cent of the steel ingot production in 1919 produced 3,015,982 gross tons in October, against 2,999,551 tons in September. Estimating the production of the remaining companies on the same basis, the October output for the country was 3,543,212 tons, or 136,277 tons per operating day, against an estimated September total of 3,523,908 tons, or 135,535 tons per operating day.

The table below gives separately the production of Bessemer and open-hearth steel ingots by months from January, 1919. No figures appear for the last four months of 1919, the gathering of statistics in that period having been suspended because of the steel strike:

Monthly Production of Steel Ingots by 30 Companies Which Produced About 85 Per Cent of Total in 1919—Gross Tons

	Open Hearth	Bessemer	All Other	Total
January, 1919	2,351,153	749,346	7,279	3,107,778
February	2,043,635	655,206	5,842	2,704,683
March	2,100,528	555,332	6,405	2,662,265
April	1,732,447	500,770	6,494	2,239,711
May	1,506,015	414,392	8,617	1,929,024
June	1,692,257	521,634	5,328	2,219,219
July	1,875,630	625,246	7,300	2,508,176
August	1,988,651	748,212	9,218	2,746,081
January, 1920	2,242,758	714,657	10,687	2,968,102
February	2,152,106	700,151	12,867	2,865,124
March	2,487,245	795,164	16,640	3,299,049
April	2,056,336	568,952	13,017	2,638,305
May	2,251,544	615,932	15,688	2,883,164
June	2,287,273	675,954	17,463	2,980,690
July	2,135,633	653,888	13,297	2,802,818
August	2,299,645	695,003	5,784	3,000,432
September	2,300,417	693,586	5,548	2,999,551
October	2,335,863	676,634	3,485	3,015,982

Plate Inquiry at Seattle

SEATTLE, WASH., Nov. 9.—An inquiry is in the Seattle market for 1250 tons of steel plates, flange quality, ¼ to ⅝ in. thick for this year delivery.

Steel conditions still are very dull and prices weak. Steel bars from warehouse have been reduced $5 per ton to 5.75c., steel plates, $6 a ton to 6c.; and base sizes steel bands $5 to 6.45c.; while steel bands under ¾ in. wide are 7.70c.

Seattle exporters have advices that mild steel flat bars rolled by Belgian mills are being offered in Shanghai, China, at prices equal to 4c., Shanghai from American mills. English export houses in China are offering iron and steel products rolled in Belgian mills at much lower prices than American mills are quoting.

Company Contrasts Living Costs

PITTSBURGH, Nov. 8.—The Union Supply Co., a subsidiary of the United States Steel Corporation, has issued a schedule of prices on a large sheet comparing costs of vegetables, fruit, meat, groceries and textiles in July of this year and on Nov. 4. The poster is headed, "Is the Cost of Living Coming Down?" and shows in parallel columns that sugar was 12½c. per lb. on Nov. 4, compared with 28c. per lb. in July; potatoes have dropped from a July price of $1.35 a peck to 45c.; coffee has decreased from 44c. per lb. to 32c. per lb.; apples from 10c. per lb. to 5c. per lb., and Lancaster gingham from 30c. a yd. to 23c. a yd.

The Metal Supply Problem in Germany—I

How War Shortages Were Met by Substitutions—Effect of the Latter on Present and Future Consumption of Copper and Tin

BY C. A. HEISE

BERLIN, GERMANY, Oct. 20.—The metal scarcity which made itself increasingly felt in Germany as the war went on compelled the German industry to husband its resources to the utmost and to this were due many sweeping changes in the metal working industry. Substitute materials were introduced, proving serviceable to a greater or lesser extent, but it goes without saying that much nonsense was published on that subject by the press of all countries. Judging by some reports, the Germans were credited with almost superhuman power in meeting any industrial emergency, while others considered it a patriotic duty to ignore any new feat performed by German industry or discount all such reports. Needless to say, neither of these extreme views was likely to convey a clear idea as to how Germany tackled the metal shortage problem. It is proposed, therefore, to give in the following a close survey of the activity of the German metal working industry during the war, with special reference to the raw material shortage as well as employment of substitutes. All statements made are based on official data.

Copper

Soon after the outbreak of the war and the ensuing blockade the supply of copper from overseas was cut off. Prior to the war half the American copper production found its way to Germany. Production from domestic copper ores amounted to only 25,200 tons in 1913; domestic consumption reached approximately 200,000 tons, while the total consumption, including exports of finished and semi-finished products, was over 260,000 tons. It is estimated that before the war Germany imported 350,000,000 marks' worth of copper.

Scrap Copper Gathered Everywhere

The copper consumption of the German war and munition industry was approximately 125,000 tons per year. Supplies from neutral countries did not relieve materially the situation created by the British blockade. Furthermore, domestic production slumped nearly 50 per cent during the first months through the mobilization of miners. But much time was wasted in "getting the goods." First of all, the overrun territories of Belgium, northern France and western Russia were stripped bare of every available scrap of copper and brass and considerable quantities were thus placed at the disposal of the industry. By far the largest supplies, however, were secured in Germany by the commandeering of all stocks of copper and brass and through refining old material by the electrolytic process. The quantities thus recovered were comparatively large, which is hardly surprising in view of the fact that in the years before the war at least 40,000 tons of copper manufacture was turned out. A special raw material board for the war industry was organized in order to supervise the confiscation and subsequent distribution of stocks on hand. Household and kitchen utensils alone are estimated to have yielded approximately 35,000 tons of copper. Later on the confiscation was extended to cover church bells, copper roofs, roof pipes and much apparatus formerly exclusively made of copper or copper alloy. When trench warfare set in an extensive scheme for clearing up the débris behind the front was organized and the quantities gained in the form of shell bands, fuse parts, cartridges, etc., were not inconsiderable. Besides this, all men-of-war as well as merchantmen were thoroughly overhauled and all copper parts which could be substituted by iron were removed.

Compared with the several thousands of tons gained by the electrolytic process during a month, the output of the Mansfield copper mines—the only ones of real importance in Germany—was insignificant. However, even 0.8 per cent ores were mined, with the result that the output reached at times 2300 tons per month. On account of coal shortage, this figure, however, could not be maintained. Another 1000 tons per month was obtained from reconstructed copper mines in Serbia.

Iron Replaced Copper

Strict orders were given by the Supreme Army Council to confine the use of copper and brass in the manufacture of army supplies to essential parts only. Helmet fittings, tunic buttons and other parts of the soldier's equipment formerly made of brass were substituted by iron, while for munitions in general and fuses in particular zinc took the place of brass. Copper wires in cables found a substitute in zinc, aluminum or iron.

In 1916 it was recognized that iron would have to take the place of copper to a larger extent than ever before. Cartridges, fuses, shell bands, tubes, wires for electric plants, torpedo firing tubes, propellers and many other parts were now made of iron, covered with newly invented rustproof coatings, and considerable difficulties had to be overcome till satisfactory results were achieved. The question of providing a suitable substitute for shell bands proved rather important, seeing that immense quantities were required for their manufacture. For the smaller calibers zinc gave fairly satisfactory results, while for the larger ones a special brand of electrolytic soft iron was advantageously employed. In this connection it may be stated that experiments carried out at Krupp's in Essen with soft iron produced in an open-hearth furnace resulted in turning out a product possessing practically all the features and properties of copper.

One of the immediate results of the restricted copper consumption was the substituting of marine bronze by brass having an average copper content of 57 per cent with slight additions of iron, aluminum and manganese. The results in general were satisfactory, though the composition did not prove a success in parts subject to friction and high pressure, as for instance gear wheels, worms, fuel valves, etc. For such parts marine bronze had to be employed as before; at best a 70 per cent copper containing brass was permissible, while for bushings, ordinary bearings, etc., a copper-zinc alloy in the ratio of 3 to 2 was the rule. Iron bronze, an alloy containing 57.7 per cent copper, 40 per cent zinc, 1.8 per cent iron and 0.4 lead, was also extensively used, as it lends itself equally well to forging and casting.

With the declaration of the unrestricted submarine warfare and the subsequent increase in the building of torpedo boats and submarines, the demand for brass castings for various purposes reached an unprecedented height. Fittings, propellers, torpedo tubes, etc., were made of steel castings. Corrosion was partly countered by providing the parts with a lead coating, varnishing or enameling propellers turning out a failure. Copper tubes on board ship were substituted by brass and later on by lead-coated steel tubes, while condenser tubes, formerly containing 98 per cent of copper, were then made of a composition the copper content of which was gradually reduced to 70 and 65 per cent. Turbine blades were also made of an alloy poorer in copper than hitherto used, while nickel-plated and enameled steel blades did not come up to expectation.

The restrictions in the consumption of copper were not confined to the navy, but covered all the other industries, in particular the electrical industry. Principally aluminum took the place of copper—zinc or iron

not entering into consideration—and it would appear that for a long time to come aluminum will succeed in holding its place against copper.

Germany Will Buy Less Copper

The following table shows the distribution of copper supplies before the war:

	Per Cent
Electrical industry	40
Brass works	30
Copper rolling mills	15
General engineering, boiler, container and tank factories, shipyards, railroads, foundries, fitting manufacturers, etc	13.5
Chemical works	1.5

In general it may be said that for purely economic reasons alone Germany will have to curtail her consumption of copper to a minimum during the next decade. Moreover, the war in general and the submarine warfare in special has demonstrated the fact that modern steel casting technics has now reached a pitch of perfection which robs brass of much of its boasted superiority in that respect. Even for countries in a more fortunate position than Germany, the problem of cheapening production with a view of successfully competing in the world's market is inseparably connected with the raw material question.

Tin

Before the war practically the whole of Germany's supply of tin was obtained from Bolivian ores, the value of which—including the quantities of raw tin coming from India—amounted to nearly 100,000,000 marks in 1913. As with the other raw materials which Germany imported, supplies of tin from abroad ceased some months after the outbreak of the war, and though limited quantities were coming forth from Holland for some time afterwards, even that source could not make up for the absence of the Bolivian ores. There were but two ways of grappling with the supply problem: commandeering all available stocks and confiscating all tin manufacture, including bronze, and strictest economy in the use of tin, confining its use to essential parts only. The consumption in Germany amounted to approximately 20,000 tons in 1913.

Church bells were a valuable source of supply, the bronze of the bells containing about 15 to 20 per cent of tin, which was recovered by the electrolytic process. Obsolete guns, munitions, spare parts as well as old cans made of tin plate also came very handy in replenishing the dwindling stocks. Besides bronze and tin alloys, the lids of beer bumpers, organ pipes and other articles made of tin helped to cover the urgent needs. Many articles possessing an artistic or historic value were gladly surrendered on the appeal of the government. Further supplies were obtained from the vast quantities of tin and tungsten ashes which were found in the neighborhood of the exhausted tin mines and were passed through a refining process.

Substitutes for Tin

When it was found that the machinery industry consumed enormous quantities of tin for bearing metals, the firms were advised to make the necessary alterations in the designs so as to render bearings adaptable for oil-ring lubrication wherever possible or substitute white metal bearings by ball or roller bearings. Numerous substitutes appeared on the market of which lead and zinc were the principal elements, with additions of copper, aluminum and calcium.

A composition which gave satisfactory results in the marine service and which was chiefly used for electric motors of larger sizes contained 78 Zn., 12.9 Cu., 6 Al., 1.7 Pb., 0.9 Fe., 0.1 Si., while for smaller sizes with a bearing pressure of, say, 85 lb. per sq. in. a 91 Zn., 8.5 Cu and 0.5 Al. alloy was used. On the other hand, experience showed that for bearings subject to a pressure of, say, 420 lb. per sq. in. and with shafts running at a high speed, zinc compositions were a failure on account of the hardness of the metal causing excessive heating or even seizure.

A composition that proved its serviceableness as a bearing metal for bearings subject to low loads was composed of 90 Zn., 1 Mg., 1 Pb., 6.5 Cu., 1.5 Al., having a strength of 230 lb. per sq. in. and a Brinell hardness of 112. Another substitute composition which proved very satisfactory in turbo-dynamos for torpedo boats contained 91 Zn., 8 Cu., 1 Al. Further compositions are:

93 Zn, 6 Cu, 1 Al.
78 Sn, 17 Sb, 4.3 Cu.
88.6 Zn, 6 Cu, 4.1 Al, 0.6 Fe, 0.2 Pb, 0.6 Sb.

Zinc and Other Alloys

For bearings subject to high stresses, the Association of German Engineering Works recommended zinc alloys containing 3 per cent Al. and 8 per cent Cu., while for lower stresses 3 per cent Al. and 2 per cent Cu. were considered most suitable. An addition of 1 per cent Fe. to those compositions gave satisfactory results. An alloy particularly adapted for marine purposes contained 78 Pb., 2 Cu., 8 Sb., 12 Sn., and it will be interesting to learn that similar compositions containing a high percentage of lead were successfully and satisfactorily employed, one firm manufacturing a 95 Pb., 3 Mg., 2 Zn. alloy which was extensively used for compressor bearings subject to high stresses. Calcium bearing metals were also introduced, especially for electric motors and marine engines up to 600 r.p.m. These metals were not a success at first, which was chiefly due to difficulties in casting.

Aluminum was also largely employed in bearing metal alloys, many of the famous Benz aeroplane engines being equipped with bearings composed of 0.3 Fe., 9 Zn., 85 Al., 5.7 Cu. or 81 Al., 7 Cu., 11 Zn., 1 Fe. It is interesting to note that these compositions were practically immune to corrosion. Even cast iron bearings appeared on the market, the well known makers of small machine tools, Loewe & Co., at Berlin, producing a special brand which lent itself well to all-round purposes, though apparently less adapted for marine service. The tin content of the bearings used in turbo-exhausters and oil dynamos of the big submarine boats was reduced to 42 per cent, while for the turbines of torpedo boats it was found impracticable to use less than 40 per cent. Further reports from makers of large turbo-compressors would show that 40 per cent tin compositions were used without causing undue trouble. For smaller sizes the tin content was even as low as 20 per cent, while for bearings subject to great stresses a tin content of 70 per cent proved the required minimum.

Parallel with the restrictions covering the compositions of bearing metals went a thorough reduction of the tin content in the various solder compositions. While in pre-war days a tin content of approximately 60 per cent was the general rule, the exigencies of the times compelled manufacturers to cut it down to 25 per cent. Reports at hand show that such compositions proved entirely satisfactory for all ordinary purposes, though in the electrical industry the minimum content of tin was fixed at 40 per cent. On the other hand, solders poor in tin or containing no tin at all were also used for various purposes, as, for instance, a 10 Sn., 10 Cd., 80 Pb. and a 2 Sn., 12 Cd., 86 Pb. composition, the latter being especially used in the manufacture of cartridges. Magnesium-lead solder compositions were not a success, but antimony solder was advantageously employed for soldering sheets and plates. Mercury solder also proved serviceable, the two compositions mostly met with being 4 Hg., 3 Sn., 93 Pb. and 8 Hg., 6 Sn., 86 Pb.

There were of course many other ways in which tin was saved or its consumption reduced to the utmost minimum. Tin-bronze or other tin alloys was substituted by brass, manganese, bronze, zinc or steel castings and cans used for food preserving were tinned on one side only or made of sheet iron or aluminum. Household and cooking utensils were no longer tinned but enameled, and condenser pipes were coated with a composition containing up to 90 per cent lead, and it was principally due to those rigorous economical measures that the tin consumption was reduced to about 1200 tons per year.

Continued Tin Shortage

As regards the future, it is fairly safe to assume that for a long time to come Germany will feel the pinch of the tin shortage. This is not only due to eco-

nomic reasons but also to the fact that there is a world-wide demand for tin which cannot be met by increased production. Bolivia and the Dutch colonies are the principal sources of supply, their aggregate output representing 70 per cent of the world's production. About 75 per cent of the Bolivian output, however, is controlled by the United States, which also imports a large share of the output of the Dutch colonies. On the other hand, there is no reason to believe that the dearth of tin will result in serious drawbacks to the German industry. The experience gained during the years of the war with the various substitute metals is being properly utilized, so that the necessity for imports on a large scale does not enter into consideration.

(To be concluded)

SWEDISH IRON INDUSTRY

Many Difficulties of Past Year—Outlook Far From Encouraging

WASHINGTON, Nov. 9.—Consul-General Dominick I. Murphy has forwarded from Stockholm a synopsis of an interview with a prominent Swedish engineer relative to the unfavorable outlook for the Swedish iron industry, as follows:

"The Swedish iron and allied industries have experienced serious difficulties during the past year owing to the general depression, the high prices prevailing in the world's markets, and the enormously increased cost of manufacture. Whether international conditions will improve in the near future is impossible to predict, but should there be an improvement the Swedish iron industry will be forced to meet the keenest competition from the iron and steel manufacturers in other countries.

"As for the domestic market the exceedingly high prices of fuel will make it difficult for the industry to meet foreign competition. There will be no such difficulties in foreign countries, for they have the advantage in the present rates of exchange.

"The question of exports is still more unsatisfactory. During the war a number of English purchasers of Swedish pig iron and steel were forced to use domestic materials, which at first were much below the Swedish raw materials in quality. During the war, however, there came a very considerable improvement, especially after the adoption of the electric refining method. All this, quite apart from the general depression in all industries, will make it exceedingly difficult, if not impossible, for the iron industry in Sweden to regain its former export market. Swedish pig iron was used to a very large extent in the manufacture of munitions of war in England, and one or two other belligerent countries. If the present high price of production could only be brought down, the situation would be considerably improved. The cost of making a ton of pig iron at a Swedish factory in 1913 was 8.09 crowns ($2.17), but in 1918 it had increased to 285.32 crowns ($6.47). There is no reason to believe that the price of ore will be reduced to any extent, neither can a reduction in the high charcoal price be expected. As for wages the prospect is that they will be increased, the 8-hr. law not having fully satisfied the demands of the workingman.

"The only possibility for an extensive reduction in the cost of production would be a reduction of the present freight rates. Freights for pig iron increased from 1914 to the autumn of 1919 no less than 44.80 crowns ($12). If it is realized that the total annual cost of a ton of pig iron was but 80.89 crowns ($21.68) in 1913, it will be readily seen that this enormous freight increase must be destructive to the industry. The factories in the central section of Sweden have to pay exceedingly high freights in order to get the goods to the shipping port, and these freights have increased by 18 crowns ($4.82) per ton. The iron industry in Sweden has had to stand an increase in freight alone of about 62.80 crowns ($16.83) per ton or about 77 per cent of the cost of production before the war."

GERMAN COMPETITION STRONG

Belgian Prices Parallel American—Japanese Prices Show No Improvement

While foreign competition in export markets is becoming more acute, German offerings of iron, steel and machinery are evidently assuming a more serious aspect than Belgian sales. With the domestic market falling, exporters point out that sales of Belgian material into South America and the Dutch East Indies are but little lower than prevailing American prices. One exporter recently lost a fairly heavy tonnage of structural steel in Buenos Aires to a Belgian exporter, who quoted the equivalent of 2.50c. per lb., Pittsburgh, plus ocean and railroad freight rates. German quotations, however, preclude the possibility of competition on a price basis. Recent sales of light rails to the Dutch East Indies are reported at $66 per ton, c.i.f. Seerabaya.

Trade with South American buyers under present unsettled market conditions is becoming increasingly difficult. An exporter who booked an order for steel bars to Buenos Aires for December-January delivery was able to ship in November, but the buyer refused to accept the order unless he shipped as specified in the contract. Exporters with canceled material encounter difficulty in reselling. A lot of 300 tons of wire rods was recently offered at $60.50 per ton, Pittsburgh, with no buyers.

Improvement in the Japanese stock market is considered by exporters in close touch with the situation as only another temporary rise similar to the recovery between the end of June and the middle of August, which was followed by a sudden decline. Prices of iron and steel show little change from the low mark reached early in October. Pig iron has decreased from 95 yen to 90 yen per ton. It is estimated that more than 1,000,000 tons of material is on the market in Japan, of which about 400,000 tons is pig iron of Oriental origin.

At the next meeting of the Diet legislation will be considered toward the proposed combination of iron and steel producers and shipyards and the raising of a protective tariff on importations of iron and steel. Shipbuilders and other consumers who are unable to obtain sufficient material for their needs from Japanese sources will probably be subsidized by the government to offset the duty laid on foreign material that they purchase.

Some business is being transacted with India, particularly in pipe. An exporter of machine tools reports through his London office large inquiries for machine tools and plant equipment, evidently destined for Near East countries.

Owing to growth in its business, the Allsteel Supply Co., J. E. Fitzgerald, president, is building a second warehouse at its property in Niles, Ohio. The company engages in a jobbing business in iron and steel products, principally sheets. Mr. Fitzgerald was formerly assistant general sales manager of the Brier Hill Steel Co., Youngstown, Ohio.

The Remy Electric Co.'s plant, Anderson, Ind., which had been closed for two weeks, has reopened some of its departments. It is announced that some employees will not be called back until there is an improvement in the automobile business. The factory of the Vulcanite Roofing Co. has closed indefinitely for lack of business, 150 employees being laid off.

Non-Ferrous Metals

The Week's Prices

Cents Per Pound for Early Delivery

	Copper, New York		Tin	Lead		Zinc	
Nov.	Lake	Electro-lytic	New York	New York	St. Louis	New York	St. Louis
3	15.00	15.00	39.75	6.75	6.50	7.35	6.90
4	15.00	15.00	39.00	6.75	6.50	7.35	6.90
5	15.00	15.00	38.75	6.75	6.50	7.30	6.85
6	15.00	15.00	.....	6.75	6.50	7.30	6.85
8	15.00	15.00	37.50	6.75	6.50	7.25	6.80
9	15.00	15.00	37.00	6.75	6.50	7.25	6.80

NEW YORK, Nov. 9.

The markets continue quite inactive, with quotations fairly steady except for tin. That copper has reached the bottom is the opinion in some quarters, but buying is still of small proportions. The price of tin has declined quite decidedly and there is almost no buying. Both the lead and zinc markets are fairly quiet, with quotations slightly lower. Antimony is also a little lower.

New York

Copper.—The market may be said to have steadied itself at close to 15c., New York, for both Lake and electrolytic, which is the quotation of most of the leading as well as of the small producers. Small lots are reported to have changed hands at slightly under this level, but the few sales that have been made to regular consumers have been at 15c., New York, for the remainder of the year and at 15.25c., New York, for delivery in the first quarter. In no case, however, may demand be said to have quickened, although the feeling is considerably better. The fact that industry in general has slackened is a cause of conservatism on the part of consumers to increase stocks. There is a belief in some quarters that the bottom has been reached, but in view of the course of the market in the last two months there is not much confidence back of this feeling. The one fairly bright side of the market is continued buying, although on a small scale, by foreign countries.

Tin.—This market is dull and stagnant. Consumers continue indifferent and dealers are not trading one way or the other, even speculation having almost disappeared. The market on this side is largely affected by the course of the London market, which, after a rebound from the low levels caused by the coal strike, has again receded, the decline in the last two days having been pronounced, due largely to speculative operations. To-day spot standard tin was quoted in London at £245 15s., with future standard at £251 15s., and spot Straits at £248 per ton, all of these prices being from £11 to £22 per ton lower than a week ago, although not as low as the price reached at the time of the coal strike about three weeks ago. There have been no sales on the New York Metal Exchange in the last week, but on last Friday a few transactions were put through by dealers at 38.75c., New York, for spot Straits, with November-December shipment sold at 40c. London attempted to make purchases here on that day, but by the time its bids were received, sellers had withdrawn from the market. Spot Straits tin to-day is quoted at 37c., New York. Another factor for the decline has been the recession in the pound sterling. Arrivals thus far this month have been 2150 tons, with 3640 tons reported afloat. Imports for the year to Nov. 1 have been 44,923 tons against 25,896 tons for the same period last year.

Lead.—The market is exceedingly quiet and quotations are almost nominal at 6.75c., New York, or 6.50c., St. Louis, in the outside market. A very limited amount of business has been done at slightly above these levels and also at slightly below them, but in small volume. Imported lead no longer is a factor, the cost of importation being considerably above the present domestic level. Late yesterday the American Smelting & Refining Co. reduced its quotation ¼c. per lb. to 6.75c., St. Louis, or 7c., New York.

Zinc.—Extreme dullness continues to characterize this market, but the undertone is fairly encouraging. Domestic demand for prime Western is exceedingly light and confined to the immediate needs of some galvanizers. Brass interests seem for the present to be feeling the slowing up in business and are not increasing their stocks. Prime Western for early delivery is quoted at 6.80c. to 6.90c., St. Louis, or 7.25c. to 7.35c., New York. There is a disinclination to quote for future positions and producers are meeting only the demands for early delivery, such as they are.

Antimony.—This market is also excedingly dull, with wholesale lots for early delivery quoted at 6.25c., New York, duty paid.

Aluminum.—The leading interest continues to quote virgin metal, 98 to 99 per cent pure, at 32.90c. f.o.b. producer's plant for wholesale lots for early delivery, while the same grade from other sellers is obtainable at 28c. to 29c., New York.

Old Metals.—The downward movement has stopped and the market shows signs of reaction. Dealers' selling prices are nominally as follows:

	Cents Per Lb.
Copper, heavy and crucible	15.00
Copper, heavy and wire	14.00
Copper, light and bottoms	12.50
Brass, heavy	10.25
Brass, light	7.50
Heavy machine composition	15.00
No. 1 yellow rod brass turnings	8.00
No. 1 red brass or composition turnings	12.50
Lead, heavy	6.00
Lead, tea	5.00
Zinc	4.50

Chicago

Nov. 9.—Market activity is at a low ebb and tin and antimony have declined slightly below previous quotations. Sheet galvanizers have bought a little zinc, but merely on a hand-to-mouth basis, and a little copper has been taken by dealers on speculation. On the whole, however, current buying is almost negligible. Apparently other factors besides price are preventing purchases, as present quotations are practically at prewar levels. Some of the old metals have also declined. We quote Lake copper at 16c. in carload lots; tin, 41c.; lead, 6.75c.; spelter, 7c.; antimony, 8c. to 8.50c. On old metal we quote copper wires, crucible shapes, 10.50c.; copper clips, 10.50c.; copper bottoms, 9c.; red brass, 10.50c.; yellow brass, 7c.; lead pipe, 5c.; zinc, 4c.; pewter, No. 1, 20c.; tinfoil, 25c.; block tin, 30c.; all these being buying prices for less than carload lots.

St. Louis

Nov. 8.—The non-ferrous markets have been quiet during the week with very little demand and have ranged somewhat lower in car lots, being quoted at 6.50c. for lead and 6.87½c. for spelter. In less than car lots the quotations have been: Lead, 7c.; spelter, 7.50c.; tin, 46c.; copper, 18c.; antimony, 9c. In the Joplin district ores have been very quiet, although more mines were operating than the preceding week, but prices showed no definite change from the last report. On miscellaneous scrap metals we quote dealers' buying prices as follows: Light brass, 6c.; heavy yellow brass, 8c.; light copper, 10c.; heavy red brass, 11c.; heavy copper and copper wire, 11.50c.; pewter, 24c.; tinfoil, 30c.; zinc, 4c.; lead, 5.50c.; tea lead, 3c.; aluminum, 15c.

The Willys-Overland Co., Toledo, Ohio, last week closed down its plant for inventory and announced that it would remain closed down for an indefinite period. The plant normally employs about 15,000 men, but only a small proportion of this force has been working recently.

Due to lack of orders, the plant of the Transue-Williams Drop Forge Co. at Alliance, Ohio, has been closed, affecting 800 employees. Departments will be operated as business justifies, say officials.

Prices Finished Iron and Steel, f.o.b. Pittsburgh

Freight Rates

Freight rates from Pittsburgh on finished iron and steel products, in carload lots, to points named, per 100 lb., are as follows:

Philadelphia	$0.35	St. Paul	0.695
Baltimore	0.335	Omaha	0.815
New York	0.38	Omaha (pipe)	0.78
Boston	0.415	Denver	1.35
Buffalo	0.295	Denver (wire products)	1.415
Cleveland	0.24	Pacific Coast	1.665
Cincinnati	0.33	Pacific Coast, ship plates	1.335
Indianapolis	0.345	Birmingham	0.765
Chicago	0.38	Jacksonville, all rail	0.555
St. Louis	0.475	Jacksonville, rail and water	0.46
Kansas City	0.815	New Orleans	0.515
Kansas City (pipe)	0.78		

The minimum carload to most of the foregoing points is 36,000 lb. To Denver the minimum loading is 40,000 lb., while to the Pacific Coast on all iron and steel products, except structural material, the minimum is 80,000 lb. On the latter item the rate applies to a minimum of 50,000 lb., and there is an extra charge of 9c. per 100 lb. on carloads of a minimum of 40,000 lb. On shipments of wrought iron and steel pipe to Kansas City, St. Paul, Omaha and Denver, the minimum carload is 46,000 lb. On iron and steel items not noted above the rates vary somewhat and are given in detail in the regular railroad tariffs.

Structural Material

I-beams, 3 to 15 in.; channels, 3 to 15 in., angles, 3 to 6 in., on one or both legs, ¼ in. thick and over, and zees, structural sizes, 2.45c. to 3c.

Wire Products

Wire nails, $3.25 to $4.50 base per keg; galvanized, 1 in. and longer, including large-head barbed roofing nails, taking an advance over this price of $1.50 to $2 and shorter than 1 in., $2 to $2.50. Bright basic wire, $3.25 to $4 per 100 lb.; annealed fence wire, Nos. 6 to 9, $3.25 as quoted by the American Steel & Wire Co., and No. 8 and heavier, $4 to $4.25, the range of independent makers; galvanized wire, $3.95 to $4.70; galvanized barbed wire and fence staples, $4.10 to $5.20; painted barbed wire, $3.40 to $4.60; polished fence staples, $3.40 to $4.50; cement-coated nails, per count keg, $2.85 to $4.10; these prices being subject to the usual advances for the smaller trade, all f.o.b. Pittsburgh, freight added to point of delivery, terms 60 days, net, less 2 per cent off for cash in 10 days. Discounts on woven-wire fencing are 55 to 58 per cent off list for carload lots, 54 to 57 per cent for 1000-rod lots, and 53 to 56 per cent for small lots, f.o.b. Pittsburgh.

Bolts, Nuts and Rivets

Large structural and ship rivets.....$4.75 to $5.00 base
Large boiler rivets..... 4.85 to 5.10 base
Small rivets .....45 to 40 per cent off list
Small machine bolts, rolled threads
40 and 5 to 25 and 10 per cent off list
Same sizes in cut threads.....30 and 10 to 25 per cent off list
Longer and larger sizes of machine bolts
30 to 25 per cent off list
Carriage bolts, ⅝-in. x 6-in.:
Smaller and shorter, rolled threads
30 and 10 to 20 per cent off list
Cut threads .....30 to 20 per cent off list
Longer and larger sizes.....25 to 20 per cent off list
Lag bolts .....45 to 40 per cent off list
Plow bolts Nos. 1, 2 and 3 head.....35 per cent off list
Other style heads .....20 per cent extra
Machine bolts, c.p.c. and t. nuts ⅜-in. x 4-in.:
Smaller and shorter.....30 to 10 per cent off list
Longer and larger sizes.....20 to 10 per cent off list
Hot pressed sq. or hex. blank nuts.....$1.50 to 50c. off list
Tapped nuts .....$1.00 off list
C. p. c. & t. sq. or hex. nuts, blank.....list plus $1.00
C. p. c. & t. sq. or hex. nuts, tapped.....list plus $1.00
Semi-finished hex. nuts, U. S. S. and S. A. E.:
⅝-in. and larger.....50 and 10 to 40 per cent off list
9/16-in. and smaller.....50 and 10 to 40 per cent off list
Stove bolts in packages.....60 and 10 per cent off list
Stove bolts in bulk.....60, 10 and 2½ per cent off list
Tire bolts .....50 per cent off list
Track bolts .....7c. base
Iron cap screws .....40 per cent off list
Set screws .....40 and 10 per cent off list

One cent per lb. extra for less than 200 kegs. Rivets in 100-lb. kegs 25c. extra.

All prices carry standard extras f.o.b. Pittsburgh.

Wire Rods

No. 5 common basic or Bessemer rods to domestic consumers, $57 to $70; chain rods, $57 to $70; screw stock rods, $62 to $75; rivet and bolt rods and other rods of that character, $57 to $70; high carbon rods, $80 to $95, depending on carbons.

Railroad Spikes and Track Bolts

Railroad spikes, 9/16-in. and larger, $4 to $4.25 per 100 lb. in lots of 200 kegs of 200 lb. each or more; spikes, ½-in., ⅝-in. and 7/16-in., $4.40 to $5; 5/16-in., $5 to $5.75; track bolts, $7. Boat and barge spikes, $4.40 to $5 per 100 lb. in carload lots of 200 kegs or more, f.o.b. Pittsburgh. Tie plates, $3 to $4 per 100 lb.

Terne Plates

Prices of terne plates are as follows: 8-lb. coating, 200 lb., $13.80 per package; 8-lb. coating, I. C., $14.10; 12-lb. coating, I. C., $15.80; 15-lb. coating, I. C., $16.80; 20-lb. coating, I. C., $18.05; 25-lb. coating, I. C., $19.30; 30-lb. coating, I. C., $20.30; 35-lb. coating, I. C., $21.30; 40-lb. coating, I. C., $22.30 per package, all f.o.b. Pittsburgh, freight added to point of delivery.

Iron and Steel Bars

Steel bars at 2.35c. to 3.25c. from mill. Common bar iron, 4.15c. to 4.50c.

Wrought Pipe

The following discounts are to jobbers for carload lots on the Pittsburgh basing card:

Butt Weld

Steel			Iron		
Inches	Black	Galv.	Inches	Black	Galv.
⅛, ¼ and ⅜	47 to 50½	20½ to 24	⅛	15½ to 25½	+1½ to 11½
½	51 to 54½	36½ to 40	¼	19½ to 29½	1½ to 11½
⅝ to 3	54 to 57½	41½ to 44	⅜ to 1¼	24½ to 34½	8 to 18½

Lap Weld

2	47 to 50½	34½ to 38	2	20½ to 28½	6½ to 14½
2½ to 6	50 to 53½	37½ to 41	2½ to 6	22½ to 30½	9½ to 17½
7 to 12	47 to 50½	33½ to 37	7 to 12	19½ to 27½	6½ to 14½
13 and 14	37½ to 41				
15	35 to 38½				

Butt Weld, extra strong, plain ends

⅛, ¼ and ⅜	43 to 46½	25½ to 29	⅛	+17	+50
½	48 to 51½	35½ to 39	¼	13½ to 23½	6½ to+3½
¾ to 1¼	52 to 55½	39½ to 43	⅜	18½ to 28½	5½ to 15½
2 to 3	53 to 56½	40½ to 44	½ to 1¼	24½ to 34½	9½ to 19½

Lap Weld, extra strong, plain ends

2	45 to 48½	33½ to 37	2	21½ to 29½	8½ to 16½
2½ to 4	48 to 51½	36½ to 40	2½ to 4	23½ to 31½	11½ to 19½
4½ to 6	47 to 50½	35½ to 39	4½ to 6	22½ to 30½	10½ to 18½
7 to 8	43 to 46½	29½ to 33	7 to 8	14½ to 22½	2½ to 10½
9 to 12	38 to 41½	24½ to 28	9 to 12	9½ to 17½	5½ to+2½

To the large jobbing trade an additional 5 per cent is allowed over the above discounts, which are subject to the usual variations in weight of 5 per cent.

On butt and lap weld sizes of black iron pipe, discounts for less than carload lots to jobbers have been seven (7) points lower (higher price) than carload lots and on butt and lap weld galvanized iron pipes have been nine (9) points lower (higher price).

Boiler Tubes

The following are the prices for carload lots f.o.b. Pittsburgh:

Lap Welded Steel		*Charcoal Iron*	
1¾ to 1⅞ in.	+ 7 to — 19½	1½ to 1⅝ in.	+ 23
2 in.	+ 2 to — 19½	1¾ to 1⅞ in.	+ 20
2¼ to 2½ in.	3 to 30½	2 in.	+ 10 to 15
2¾ to 3¼ in.	11 to 30½	2¼ in.	+ 10 to 12
3½ to 4½ in.	20 to 40½	2½ in.	+ 1 to 10
		2¾ to 3¼ in.	— 1½ to + 3
		3½ to 4½ in.	—8 to list

Standard Commercial Seamless—Cold Drawn or Hot Rolled

	Per Net Ton		Per Net Ton
1 in.	$327	1¾ in.	$207
1¼ in.	267	2 to 2½ in.	177
1⅜ in.	257	2¾ and 3¾ in.	167
1½ in.	207	4 in.	187
		4½ to 5 in.	207

These prices do not apply to special specifications for locomotive tubes nor to special specifications for tubes for the Navy Department which will be subject to special negotiations.

Sheets

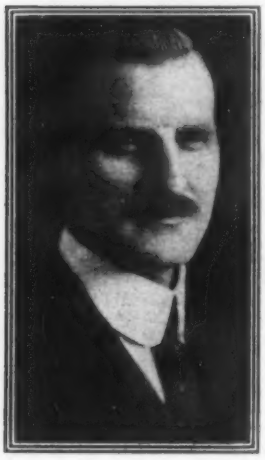
Prices of the Steel Corporation for mill shipments on sheets of United States standard gage in carloads and larger lots for indefinite delivery are given in the left-hand column. For prompt delivery, independent mills are getting up to the prices quoted in the right-hand column:

Blue Annealed

	Cents per lb.
No. 8 and heavier	3.45 to 5.20
Nos. 9 and 10 (base)	3.55 to 5.25
Nos. 11 and 12	3.60 to 5.30
Nos. 13 and 14	3.65 to 5.35
Nos. 15 and 16	3.75 to 5.45
Box Annealed, One Pass Cold Rolled	
Nos. 17 and 21	4.15 to 6.55
Nos. 22 to 24	4.20 to 6.60
Nos. 25 and 26	4.25 to 6.65
No. 27	4.30 to 6.70
No. 28 (base)	4.35 to 6.75
No. 29	4.45 to 6.85
No. 30	4.55 to 6.95
Galvanized Black Sheet Gage	
Nos. 10 and 11	4.70 to 7.25
Nos. 12 to 14	4.80 to 7.35
Nos. 15 and 16	4.95 to 7.50
Nos. 17 to 21	5.10 to 7.65
Nos. 22 to 24	5.25 to 7.80
Nos. 25 and 26	5.40 to 7.95
No. 27	5.55 to 8.10
No. 28 (base)	5.70 to 8.25
No. 29	5.95 to 8.50
No. 30	6.20 to 8.75
Tin-Mill Black Plate	
Nos. 15 and 16	4.15 to 6.55
Nos. 17 to 21	4.20 to 6.60
Nos. 22 to 24	4.25 to 6.65
Nos. 25 to 27	4.30 to 6.70
No. 28 (base)	4.35 to 6.75
No. 29	4.40 to 6.80
No. 30	4.40 to 6.80
Nos. 30½ and 31	4.45 to 6.85

PERSONAL

Edwin S. Carman, Cleveland, president-elect of the American Society of Mechanical Engineers, New York, who will take office Dec. 8, 1920, for one year, was born in Prairie Depot, Ohio, in 1878. His high school and business education was supplemented by studies in engineering at the Central Manual Training School, Cleveland. He began work in the shop of the Sun Oil Co., Toledo, Ohio, and four years later entered the engineering field with the American Machine & Mfg. Co., Cleveland. After two years in the engineering department, he was appointed chief engineer. In 1908 this company was consolidated with the Johnston & Jennings Co., Cleveland, and Mr. Carman was appointed chief engineer and manager of the engineering and machine department. In 1908 he was engaged by the Osborn Mfg. Co., Cleveland, to design and build a complete line of foundry molding machines. In 1913 he became associated with this company as chief engineer in charge of engineering and manufacture of the machine division and in 1916 was elected a director and secretary. In 1917 he was appointed works manager of both the machine and brush divisions of the company. He is past president of the Cleveland Engineering Society and was the first chairman of the Cleveland section of the American Society of Mechanical Engineers. He is the author of a treatise on foundry molding machines and pattern equipment and a contributor of papers on the art of machine molding.



EDWIN S. CARMAN

Several changes among the officials of the Pittsburgh Steel Co., Pittsburgh, were made at the organization meeting of the directors, following the annual meeting of the stockholders on Oct. 26. The office of chairman was created and John Bindley, who succeeded the late Wallace H. Rowe as president, was chosen to that position. Willis F. McCook, who has been general counsel and a director of the company, was chosen president. Clayton Snyder, who has been assistant treasurer of the company, was elected treasurer. The official personnel of the company now is as follows: Directors, John Bindley, Willis F. McCook, Emil Winter, Henry Ruhlender, Dr. William H. Nichols, William A. Nash, Edward H. Bindley, David P. Bennett and Charles E. Beeson; executive committee, John Bindley, Willis F. McCook, Emil Winter, David P. Bennett and Charles E. Beeson. Officers, chairman, John Bindley; president, Willis F. McCook; vice-presidents, Emil Winter and David P. Bennett; secretary, Harry J. Miller; treasurer, Clayton Snyder; assistant secretary, Ray Maxwell.

John J. Lamb began work as safety engineer at the headquarters of the National Safety Council, Chicago, on Nov. 1, succeeding R. H. Guerrant, who left Oct. 1 to enter the sales engineering department of the Industrial Appliance Co., Chicago. Mr. Lamb was graduated from Amherst College in 1911. Later he was connected with the tool, gage and fixture rooms of the Singer Mfg. Co., Bridgeport, Conn. At the outbreak of the war he was transferred to the Remington Arms Co. as chief inspector in the making of machine gun and rifle parts. In April, 1918, he became supervisor in smokeless powder operations for E. I. du Pont de Nemours & Co. Since July, 1919, he has been safety engineer for the Aluminum Co., Massena, N. Y.

Dr. Robert S. Quinby, service manager Hood Rubber Co., Watertown, Mass., addressed the New England Foundrymen's Association at its meeting at the Exchange Club, on Nov. 10, on "Stabilizing Employment."

George D. Berry, secretary Boston branch, National Metal Trades Association, and the Employers' Association of Eastern Massachusetts, has resigned and has been succeeded by C. H. Wilson. Mr. Berry is to be an official of other associations and will continue to make his headquarters in Boston.

The War Department has accepted the resignation of E. C. Morse, director of sales, effective Dec. 31 or earlier. Mr. Morse will return to civil life, but he has not yet decided upon the line of work he will follow when he leaves the Government service. He will be succeeded by Lt.-Col. E. S. Hartshorn, of the General Staff. During the early days of the war Mr. Morse went to Washington as representative of the Westinghouse Electric & Mfg. Co. Later he entered the Government service in the purchase branch of the construction division of the Army. He was made assistant director of sales in January, 1919, promoted to first assistant director of sales in April, 1919, and during the absence of C. W. Hare, director, in France, was acting director of sales. When Mr. Hare resigned from the service in October, 1919, because of ill-health, Mr. Morse became director of sales. Since the organization of the office of the director of sales, surplus war stocks costing more than $1,685,000,000 have been sold to the public, transferred or authorized for transfer to other Government departments. Much of this was under Mr. Morse's direct supervision. The items included $80,000,000 of ferrous metals and $65,000,000 of non-ferrous metals.

George Hird, foreman toolmaking department, Millers Falls Co., Millers Falls, Mass., hardware, has resigned to become general superintendent of the Lenox Mfg. Co., Lowell, Mass.

Prof. Arthur M. Greene, Rensselaer Polytechnic Institute, Troy, N. Y., spoke on "The Development of Pumping Machinery" before the Hartford branch, American Society of Mechanical Engineers, Hartford, Conn., Nov. 5.

George E. Quigley, 322 Ford Building, has been made Detroit representative of the Wickwire-Spencer Steel Corporation.

The Tacony Steel Co., Philadelphia, has appointed D. J. Growley, Detroit, sales agent for Michigan, with offices in the Dime Bank Building, Detroit.

Henry A. Schwartz, formerly assistant engineer Defiance Machine Works, Defiance, Ohio, has become manager of research of the National Malleable Castings Co., Cleveland.

Victor G. Angerer, a director of the Taylor-Wharton Iron & Steel Co., Philadelphia, has been elected a director of the Steinmetz Electric Motor Car Corporation, which is establishing a plant at Baltimore.

William J. Fairbairn, secretary and manager Milwaukee Metal Trades and Founders Association, was the guest of honor and principal speaker at a dinner and business conference of Fox River Valley manufacturers held at Green Bay, Wis., on Oct. 29, under the auspices of the manufacturers' division Green Bay Association of Commerce. Mr. Fairbairn spoke on "Labor Tendencies."

Frank R. Zimmerman has become secretary-treasurer of the Superior Iron Works, Co., Superior, Wis. He was formerly chief engineer of the National Iron Co., Duluth, Minn.

H. E. Beckman has been put in charge of an office and warehouse at Blanchard and Ferry streets, Newark, N. J., recently opened by the S. Obermayer Co., Chicago. The Newark office will handle the export business of the company in addition to taking care of its interests in Eastern territory.

C. W. Olson, formerly chief tool designer Continental Motors Corporation, has become factory manager of the National Steel Products Co., Detroit.

R. T. Wood, formerly with the Standard Tool Co. as industrial engineer, is now with the Glidden Co., Cleveland.

Herman P. Kruelen, until recently associated with the Charles C. Kawin Co., Chicago, has been appointed

Western representative of the W. W. Sly Mfg. Co., Cleveland, with headquarters at Chicago. During the war Mr. Kruelen was superintendent at the plant of the Wright-Martin Aircraft Co., New Brunswick, N. J.

William C. Heath, Beloit, Wis., has been promoted to the position of general manager of the Eclipse works, Fairbanks, Morse & Co., Beloit, succeeding W. S. Hovey, who has been elected vice-president in charge of all plants and production, with headquarters at Chicago. Mr. Heath is a graduate of Lewis Institute and the College of Engineering, University of Wisconsin. He has been connected with the Eclipse works 12 years, and for the last year as general superintendent.

Dolph I. Smith has resigned as manager of the Hill Pump Co.'s plant, Anderson, Ind., subsidiary of the Midwest Engine Co., Indianapolis, and is succeeded by Elmo A. Funk. E. F. Creager is appointed works manager, with A. V. Reschar as assistant.

H. H. Cosley, for 15 years with the Chicago sales force of the Cambria Steel Co. and the Midvale Steel & Ordnance Co., and previous to that for five years with the Illinois Steel Co., has been appointed contracting engineer with the Decatur Bridge Co., Decatur, Ill., with offices at 1509 Westminster Building, Chicago.

J. G. Schabert, formerly tool designer with the Yale & Towne Mfg. Co., Stamford, Conn., has been appointed chief instructor for the training school for productive employees of that company.

M. J. Plonsker has become assistant works manager of the J. I. Case Plow Works Co., Racine, Wis.

J. F. MacKay, secretary and treasurer of Willys-Overland, Ltd., of Canada, has severed his connection with the latter company to become vice-president and general manager of the John Morrow Screw & Nut Co., Ltd., Ingersoll, Ont. He will also occupy the position of vice-president of the allied industry, the Ingersoll File Co. This and other important changes are consequent upon the retirement of J. Anderson Coulter from the presidency of the two companies. Mr. Coulter has been actively connected with the industry for more than 30 years. The directors announce the election of Col. F. H. Deacon, Toronto, president; H. P. Stoneman, assistant general manager and treasurer; F. N. Norton, sales manager, and H. L. Edmonds, secretary.

Theodore J. Schaub, for a number of years assistant general sales agent of the Crucible Steel Co. of America in the Pittsburgh district, has become general sales manager of the Union Electric Steel Co., the plant and general offices of which are located at Carnegie, Pa.

William F. Hart has resigned as vice-president of the Central Tube Co., Pittsburgh, to become president of the Verona Tool Works, Oakmont, Pa., succeeding Harry S. Paul, who has sold the controlling interest in the company to Alexander Laughlin and has retired.

Emil Winter, vice-president of the Pittsburgh Steel Co., Pittsburgh, has been elected president of the Pittsburgh Steel Products Co., succeeding Willis F. McCook, recently elected president of the Pittsburgh Steel Co.

Eric Zachau, who was attached to the Pittsburgh sales office of Manning, Maxwell & Moore, Inc., and who during the previous 12 years was electrical engineer of the Shaw Crane Works at Muskegon, Mich., has returned to the crane works in the capacity of chief engineer, succeeding A. V. Light. Mr. Zachau's successor in the Pittsburgh office has not been named.

John C. Spence, superintendent grinding machine division, Norton Co., Worcester, Mass., has been made works manager of that division. G. Ellsworth Brownell, assistant superintendent, succeeds Mr. Spence as superintendent.

Albert G. Dowden, special agent of the American Steel Export Co., in charge of sales of tin plates and sheets, has associated himself with C. S. Davis & Co., Inc., jobbers in tin plates and sheets, People's Gas Building, Chicago. As vice-president of the company he will take charge of Eastern sales, opening offices and warehouse in the Bush Terminal, Brooklyn, N. Y. These offices and warehouse will be opened Nov. 15. At a later date it is intended to open a warehouse in Pittsburgh. Mr. Dowden was formerly in the sales forces of the American Sheet & Tin Plate Co. and the Weirton Steel Co., Weirton, W. Va.

L. R. Smith, president Matthew Addy Steamship & Commerce Corporation, and district manager of the Matthew Addy Co., pig iron, is on a month's trip to Cuba, Costa Rica and Panama on business and pleasure.

Julian A. Pollak presided at a dinner of the Cincinnati section of the American Society of Mechanical Engineers, held at the Business Men's Club, that city, on Nov. 5, to celebrate the fortieth anniversary of the formation of the national society. George W. Galbraith and James B. Stanwood were the principal speakers.

Raymond M. Howe of the Mellon Institute will be the speaker at the regular monthly meeting of the Pittsburgh Foundrymen's Association at Hotel Chatham, Pittsburgh, Monday evening, Nov. 15. Mr. Howe will talk on refractories, giving special attention to their application in foundry practice. Several of the refractory companies will have representatives at the meeting who will take part in the discussion.

Dr. J. S. Unger, director of the central research bureau of Carnegie Steel Co., Pittsburgh, will be the speaker at the meeting of the Westinghouse Club, Wilkinsburg, Pa., on Friday evening, Nov. 12. His subject is "Some Modern Methods of Making Steel."

OBITUARY

ARTHUR E. HAUCK, president of the Hauck Mfg. Co., maker of industrial oil burning equipment, died at his Flatbush home, Brooklyn, N. Y., Oct. 30, aged 41. He began his career by learning coppersmithing in Germany. After finishing his apprenticeship he left his mother country to follow his trade in the navy and shipyards of Belgium, France, and later in England. At 20 years of age he came to this country and obtained his first employment at the Philadelphia Navy Yards. After working for three years in the Navy coppersmithing shops in Philadelphia, Norfolk, Baltimore, and Brooklyn, he started in the oil burner business in 1902 with a small shop in Brooklyn, which developed into the concern now bearing his name. One of Mr. Hauck's principal patents is the method of vaporizing kerosene in a torch with proportioned heat resisting nozzle, the form of vaporization reducing carbonization. Another basic patent is the Hauck method of atomization through proportioned pipes and openings and with composition nozzle, and what is termed the internal combustion.

A. J. BABCOCK, who recently resigned as president of Manning, Maxwell & Moore, New York, and went on a pleasure trip abroad, died in London, England, on Oct. 30. He had been with Manning, Maxwell & Moore 22 years up to the time of his retirement, and previous to his connection with that company was for 10 years with J. A. Fay & Egan Co., machinery manufacturer, Cincinnati, and their predecessors, J. A. Fay & Co.

ALEXANDER J. MCCONE, Los Angeles, founder and president Fulton Iron Works of that city, died of apoplexy Oct. 27, at St. Vincent's Hospital. He was also one of the founders of Harron, Rickard & McCone, San Francisco, machinery dealers. He was at one time a member of the Nevada State Legislature and had resided at Los Angeles for the past five years.

WILLIAM T. PRICE, inventor of a heavy oil engine which has latterly been manufactured by the Ingersoll-Rand Co., died with pneumonia Nov. 7. He was graduated from Cornell University and early became identified with the De La Vergne Machine Co., New York, in the oil engine department. His engine was first put on the market as the Price-Rathbun engine. He was a member of the American Society of Mechanical Engineers and of the Engineers' Club in New York. He resided in Easton, Pa.

MANAGER OF MEN, NOT DRIVER

The Human Factor in a Recent Steel Works Record

Dr. Frank Crane in his column in the New York *Globe* printed recently under the title "The Human Element," a letter he had received telling of the administration of a steel plant general superintendent in western Pennsylvania. Dr. Crane makes no comment upon it further than to say that "the ideas in the letter are worth thinking about" and that "they bring out the overwhelming importance of the personal element in labor matters." The IRON AGE reprints the letter below just as it finds it, using the initials as they appear in the original, merely adding that the month referred to was October and that this 14-furnace open-hearth plant was probably one of the few that had the opportunity to run full last month:

"I am writing you concerning something that I believe you could write on with fine effect—the finest in the world, although at first sight it is a sordid and material thing.

"I am employed in a steel works. It is making a world's record this month for the production of open-hearth steel in stationary furnaces. The plant is going at a 90,000-ton gait, breaking its own and all known fourteen-furnace plant records.

"This record when it comes, will be about the eightieth record of production broken under the administration of the present general superintendent, O. J. H.

"Last year at this time the workers were on strike. Everything was rioting and discontent. Our plant was the center of the steel strike disturbance. This year the same plant is turning out world's records in steel production, and has already turned out new plant records under the new man, away up in the seventy thousands.

"The first thought a person has on perusing this collection of facts is: 'What an awful driver!' The fact is that he isn't a driver. That is just what he is not. The man who preceded him was, but O. J. H. is not.

"O. J. H. is the most quiet, modest, unassuming, approachable man they ever had on the job here. Everything is a joke with him. We have had more picnics, ball games, athletic teams, blowouts, corn roasts, boxing exhibitions and free shows since he came on the plant than we ever did before.

"The man is apparently incapable of criticism. That and irony or sarcasm, however veiled or subtle, is something he is never guilty of. His mildness has from the first excited in his men a feeling of mild compassion and sympathy. Human nature rebels against imposing on a man who is all trust and good nature.

"That is O. J. H. He is never in a hurry; always has time for a story; is always kind, modest, 'common,' good-natured, expecting confidently that every man is doing his best.

"The showing made since April 1 with this plant of strikers has been made without the discharge or transfer of a single department head. No new blood has been brought in. Nothing but a new spirit. The plant is already devoted to him. The town does not yet know him. So far he has had no time for the town.

"I believe this record to be phenomenal. You, no doubt, see all the lessons that I see in the thing and perhaps more.

"In closing, I might say that the chains of kindness are stronger than appear at first, more numerous. Every one of the 7500 employees here who may suffer injury is visited by O. J. H. with gifts and flowers on his hospital cot, and comes back to the plant a sworn friend of the boss.

"It is really a great lesson, and one the industrial world ought to know. Yours respectfully. H. P. M."

Cincinnati Chapter of Steel Treaters

The fall and winter meetings of the Cincinnati Chapter of the American Society for Steel Treating opened at the Ohio Mechanics' Institute Nov. 5. President W. A. Spears presided. Dr. Hartzell, of the Victor Safe & Lock Co., reported on the proceedings of the sessions held at the convention at Philadelphia, and also gave an interesting outline of the exhibits shown there. The president outlined the program for the coming winter, stating that it was the intention of the officers to have a number of papers submitted by local men dealing with conditions in plants, and in addition to have speakers from other cities discuss the main topics relating to treatment of steel. The president also announced that the local chapter would hold a dinner meeting at the Business Men's Club Thursday, Nov. 18, at which Colonel White, national president, and W. H. Eisenman, national secretary, would be present and address the members. A committee composed of Dr. Hartzell, Dr. Broeman and Fred Martin was appointed to consider inviting the society to hold its convention in Cincinnati next year. Messrs. Langin, Meyers and Waldo were elected members of the executive committee of the local chapter for the year.

Lake Superior Iron Ore Shipments in October

Lake Superior iron ore shipments in October were 8,848,986 gross tons, as compared with 6,201,883 tons in October, 1919. This is an increase of 2,647,103 tons or 42.68 per cent. The season's shipments to Nov. 1, this year, have been 53,122,342 tons as against 43,978,414 tons to Nov. 1, 1919, an increase of 9,143,928 tons or 20.79 per cent. The following table gives the October and season shipments by ports and the corresponding figures for 1919 in gross tons:

	Oct., 1919	Oct., 1920	To Nov. 1 1919	To Nov. 1, 1920
Escanaba	756,926	1,030,683	4,453,922	6,514,327
Marquette	280,222	482,495	1,881,786	3,117,097
Ashland	878,031	1,260,162	5,388,207	7,447,197
Superior	1,830,472	2,274,801	10,283,790	13,566,737
Duluth	1,886,951	2,432,465	15,945,625	14,089,331
Two Harbors	569,281	1,368,380	6,025,084	8,387,653
Total	6,201,883	8,848,986	43,978,414	53,122,342
Increase		2,647,103		9,143,928

The Duluth percentage this year to Nov. 1, of 26.52 per cent is considerably less than a year ago when it was 36.26 per cent of the total. The Great Northern dock at Superior is credited this year with 22.01 per cent of the total against 19.48 per cent a year ago. Two Harbors made a gain of 2 per cent this year over last or 15.78 per cent against 13.70 per cent. Escanaba made a similar gain.

Trade Changes

The Lafayette Tool & Equipment Co., Philadelphia, manufacturer of the Lafayette universal grinder, has appointed as exclusive agent in the United States Russell, Holbrook & Henderson, Inc., with sales offices at 30 Church Street, New York, and 548 Leader News Building, Cleveland.

The Miner & Peck Mfg. Co., operating the Peck drop press works, New Haven, Conn., manufacturer of Peck drop presses and lifters, has been taken over by the Birmingham Iron Foundry, Derby, Conn. The business will be operated under the old name of the Miner & Peck Mfg. Co., but will be located in Derby, Conn. George W. Peck, for many years connected with this business, will still be in charge.

Homer Strong, 301-309 State Street, Rochester, N. Y., has been changed to Homer Strong & Co., Inc.

More Blast Furnaces Going Out

No. 2 furnace of the Pittsburgh Crucible Steel Co., at Midland, Pa., Mary furnace of the Sharon Steel Hoop Co. at Lowellville, Ohio, and Union and Hamilton furnaces in the Hanging Rock district of Ohio have gone out since Nov. 1. The Midvale Steel & Ordnance Co. has blown out two furnaces at Johnstown, Pa., this month. One of its furnaces at Coatesville, Pa., is about to go out and a second in that group will follow shortly.

Machinery Markets and News of the Works

FEW PRICE REDUCTIONS

Only Three or Four Declines So Far in Machine Tools

Some Improvement in Sentiment, Particularly at Chicago, Follows Election

While all of the machine-tool markets are quiet, there is a decided improvement in sentiment as a result of the outcome of the election. At Chicago a fair volume of business has been done in the several days since the election, but sales are mostly single tools.

The principal development in the East is an inquiry by the Erie Railroad for six or eight machines, which may or may not betoken the beginning of railroad buying by Eastern roads. The Virginian Railroad is expected to come into the market before the first of the year, and other roads have substantial requirements listed, but little definite information is to be had as to when actual buying will be done.

Some pending lists, particularly those issued by railroads at Chicago, are being held up in the expectation that lower prices are in sight, but there have been few reductions. However, a maker of turret machinery has reduced prices 15 per cent, a line of medium-priced lathes has declined 20 per cent, a line of internal grinding machines 10 per cent. Machine-tool manufacturers contend that labor costs still remain high, and that reductions in prices are not justified by any corresponding reduction in the costs of manufacture.

New York

NEW YORK, Nov. 9.

While the outcome of the election is generally regarded in the machine-tool trade as tending toward the improvement of business sentiment, there has as yet been little, if any, activity in the local market. A hint of possible railroad buying, however, comes with an inquiry by the Erie Railroad for six or eight tools, including lathes, radial drills and a boring mill. The Virginian Railroad, it is expected, will issue a list before the first of the year, and other Eastern roads are also expected to come into the market for shop equipment, though little definite information is available as to the ultimate extent of railroad purchases.

One manufacturer of turret machinery has reduced prices, but other makers of machine tools continue their old prices without change. A discussion of business conditions will take place this week at the annual fall convention of the National Machine Tool Builders' Association.

The crane market is inactive, few new inquiries having appeared and no orders of importance being placed. The M. W. Kellogg Co., Jersey City, N. J., may be in the market shortly for about 8 overhead traveling cranes ranging from 10-ton to 50-ton capacity. The American Car & Foundry Co., New York, has not yet purchased the 5-ton crane for which it recently inquired, but has purchased a 55-in. lifting magnet from the Electric Controller & Mfg. Co. for Chicago. The Shepard Electric Crane & Hoist Co. has sold one 3-ton, 29-ft. span overhead traveling crane to the Pennsylvania Foundry & Mfg. Co., Reading, Pa.

The Cutler-Hammer Mfg. Co., Milwaukee and New York, has recently acquired the property at 137th Street and Southern Boulevard, New York, as an additional plant for the manufacture of Thermoplax and Pyroplax molded insulation. The five-story building has been completely equipped for this work and when operating at capacity will have an output equal to the company's insulation plant in Milwaukee, which has been running two shifts night and day for the past three years. The New York works will take care of its Eastern business. F. J. Boller, formerly of the Milwaukee insulation department, is in charge of the plant.

The Display Doughnut Machine Corporation, New York, has been incorporated with a capital of $100,000, by E. M. Steindler, C. A. Houston and G. J. Tapper, 200 Fifth Avenue, New York, to manufacture special machinery.

The S. P. Ellsworth Co., 40 South Eighth Street, Brooklyn, manufacturer of machinery and parts, has increased its capital from $15,000 to $100,000.

Shapiro & Aronson, 20 Warren Street, New York, manufacturers of lighting fixtures and gas equipment, have completed plans for a one-story brick and steel addition to their plant on Glenmore Avenue, Brooklyn, 100 x 200 ft., to cost about $50,000. Henry J. Nurich, 772 Broadway, Brooklyn, is architect.

The East Randolph Mfg. Corporation, East Randolph, N. Y., has been incorporated with a capital of $50,000 by C. C. Tennies, R. and S. C. Henning, to manufacture automobile parts and equipment.

The Paper Working Machine Co., Avenue U Brooklyn, manufacturer of machinery, has leased a one-story factory at Palmetto Street and St. Nicholas Avenue, for the establishment of a new plant.

The Jewett Machine Co., Long Island City, N. Y., has leased a building to be erected by the Merchants Holding Co., on South Washington Place, Long Island City. It will comprise about 9000 sq. ft. of floor area, and will be equipped for the repair of heavy motor trucks, parts manufacture, etc.

The Zorzi Corporation, New York, has been incorporated, with a capital of $1,000,000, by J. J. Kieran, M. Abrahams and R. W. Gilmore, 10 East Forty-eighth Street, to manufacture automobile bodies, parts, etc.

Betts & Betts, Inc., 511 West Forty-second Street, New York, manufacturer of electrical specialties, has increased its capital from $50,000 to $100,000.

The American Hard Rubber Co., 11 Mercer Street, New York, has awarded miscellaneous contracts, for the erection and completion of a two-story addition at Third Avenue and Fifth Street, College Point, L. I., to cost about $250,000, including equipment. Walter Kidde & Co., 140 Cedar Street, New York, are engineers.

The Troy Furnace Corporation, Troy, N. Y., has been incorporated, with a capital of $500,000, by F. B. and C. R. Baird, Troy; and W. A. Yates, Buffalo, to manufacture furnaces, plates, and other iron and steel products.

The Dymalkon Metals Corporation, Croton-on-Hudson, N. Y., has filed notice of dissolution under State laws.

The Department of Public Welfare, Municipal Building, New York, will build a new power house at the Sea View Hospital, West New Brighton, S. I., to cost about $50,000.

The Atlas Metal Stamping Co., Brooklyn, has been incorporated with a capital of $150,000 by N. W. Amdur, M. Tachma and I. Blickman, 563 Sixteenth Street, to manufacture stamped metal products.

The New York Edison Co., 55 Duane Street, New York, is completing plans for a new electric generating plant in the Fort Morris section to cost about $5,500,000, including machinery. It has a site aggregating 450 x 535 ft., and a large portion of this will be used for the initial building.

The Stalwart Tool Corporation, New York, has been incorporated, with a capital of $100,000, by P. and I. Weisbrot, F. W. Grossman, 691 East 137th Street, to manufacture tools and machinery.

The Borough Park Garage, Inc., 1434 Forty-ninth Street, Brooklyn, is taking bids for a new four-story service building and repair works, at Fourteenth Avenue and Thirty-eighth Street, to cost about $100,000. Thomas Rubin is president.

The Dean Machinery Corporation, New York, has been incorporated, with a capital of $30,000, by B. T. Bixby, L. P. Jillson and M. Hartung, 1086 Ninety-fourth Street, Brooklyn, to manufacture machinery and parts.

The Peninsular Commerce Corporation, New York, has been incorporated, with a capital of $50,000, by E. Seixas,

B. H. and F. Frank, 352 West Forty-sixth Street, to manufacture machinery and tools.

The Aluminum Ware Co., 557 East Clinton Street, Elmira, N. Y., has filed plans for its new two-story plant, 100 x 136 ft., at Elmira Heights.

The Noiseless Typewriter Co., 253 Broadway, New York, with works at Middletown, N. Y., has perfected reorganization plans following recent incorporation under Delaware laws, with capital of $5,000,000. It will arrange a fund of $250,000 in additional capital for expansion in manufacturing facilities. Employment is now being given to about 700 persons at its works.

The Atlantic Enameling Corporation, New York, has been incorporated, with a capital of $500,000, by D. W. Armstrong, Jr., N. Chasid, and J. Feldt, 220 West Forty-second Street, to manufacture enamelware products.

The Empire Tube & Steel Corporation, College Point, L. I., is considering plans for the erection of new works at Buffalo, and negotiations are under way for the acquisition of a site. It is proposed to remove the present plant to this location when the new building is ready for occupancy.

The Ford Motor Co., Detroit, has commissioned Stone & Webster, 147 Milk Street, Boston, to prepare plans and handle the engineering work in connection with its proposed new plant at Green Island, Troy, N. Y., for the manufacture of tractors, parts, etc. It will include a hydroelectric power plant.

The East Fifty-seventh Street Garage, Inc., New York, recently organized, has acquired the four-story building at 156 East Fifty-seventh Street, 50 x 100 ft., for an automobile service building and repair works.

The American Can Co., 120 Broadway, New York, has had plans prepared for an addition to its plant on Elizabeth Avenue, Newark, for the manufacture of machinery for can production. The extension, with equipment, is estimated to cost in excess of $300,000. Plans and specifications have not as yet been given out for estimates, and it is said that construction will begin next spring.

The Anchor Saw Mills Co., Memphis, Tenn., with plant at Lenner, La., has leased the three-story building at 432-36 Washington Street, New York, for the establishment of a local plant. The company has an option to purchase the property at $60,000.

The Acme Lighting Fixture Co., New York, has been incorporated, with a capital of $30,000, by M. Ehrlich, S. S. Kogan and T. L. Sklamberg, 299 Broadway, to manufacture metal electric and gas fixtures.

The Paterson Bobbin & Loom Builders, Inc., Paterson, N. J., has been incorporated with a capital of $125,000 by Isadore Hammer and Louis Urdang, to manufacture textile machinery.

The General Optical Co., Mt. Vernon, N. Y., is having plans prepared by Woodwell & Lesser, architects, 501 Fifth Avenue, New York, for the erection of its plant addition at Tilton, N. H., to cost about $50,000.

The Lincoln Vending Corporation, New York, has been incorporated, with a capital of $100,000, by E., W. J. and F. Tintera, 171 East Ninetieth Street, to manufacture vending machines, automatic equipment, etc.

The Cobro Mfg. Co., Vineland, N. J., has been incorporated, with a capital of $150,000, by G. E. Matteson, David S. Cohen and Louis M. Sanders, to manufacture talking machines and parts, spring motors, etc.

The Monmouth Metal Co., Matawan, N. J., has been organized by William T. Van Alstyne and William A. Smith, to manufacture brass, copper and other metal products.

The W. M. Kellogg Co., 117 West Side Avenue, Jersey City, N. J., manufacturer of pipe, fittings, etc., has filed plans for a one-story extension.

The Ideal Motor Appliance Co., Woodhaven, N. J., has been incorporated, with a capital of $300,000, by Julius Brimlent and William J. Ellison, Woodhaven, and Fred J. Von Dohren, Weehawken, N. J., to manufacture electrical apparatus.

The Ajax Battery Co., Inc., Passaic, N. J., has been incorporated, with a capital of $500,000, by Delos C. Gibson, Joseph H. Lefferts and Richard Baker, all of Garfield, N. J., to manufacture electric storage batteries.

The Experimental Machine Works, 405 Grand Street, Jersey City, N. J., has filed notice of organization to manufacture machinery and parts. E. J. Devereau, 218 Wilkinson Avenue, heads the company.

The Louis Sacks Iron Foundry, Wilson Avenue, Newark, N. J., has completed the installation of a new 70-in. cupola at its plant, providing for an increased output of about 40 tons of gray iron castings per day. Other extensions have been arranged to allow for increased production in semi-steel and malleable castings.

At the general election, Nov. 2, citizens at Newark, N. J., approved the referendum providing for the construction of a municipal electric light and power plant to cost close to $15,000,000. The Department of Streets and Public Improvements (Director Raymond) will handle the initial features of the work.

The Luthy Storage Battery Corporation, 215 Emmett Street, Newark, manufacturer of electrical batteries, has been incorporated under State laws with a capital of $4,000,000.

The New York Auto Top Co., 262 Halsey Street, Newark, has completed plans for a new two-story plant, 26 x 118 ft., at Astor and Broad streets, to cost about $50,000. Bachoff, Jones & Cook, 9 Clinton Street, are architects.

The Westinghouse Electric & Mfg. Co., 95 Orange Street, Newark, has preliminary plans under way for a three-story addition, brick and concrete, 40 x 115 ft.

The Kwick Start Spark Plug Co., 16 Boyden Place, Newark, has increased its capital from $125,000 to $500,000.

A petition in bankruptcy has been filed against the Hamblin Tool Mfg. Co., 42 Mechanic Street, Newark.

The Summit Garage & Machine Shop, Jersey City, N. J., has filed notice of organization to operate a machine works at 496-98 Summit Avenue for repairs, parts manufacture, etc. Harry J. Williams, 34 Jones Street, heads the company.

The Hanson Tool & Machinery Co., Hackensack, N. J., has been incorporated, with a capital of $200,000, by Rasmus P. Hanson, Hudson Heights; Edward A. Gantert, Leonia, and Howard Mackay, Hackensack, to manufacture machinery and tools.

The Electrical Material Co., Wallington, N. J., has been organized by George Emerson and Walter L. Fischer to manufacture electrical equipment.

Buffalo

BUFFALO, Nov. 8.

The National Lamp Works of the General Electric Co., Ferry Street and Fillmore Avenue, Buffalo, will build a two-story machine shop at 757 East Ferry Street for the manufacture of light machinery. It will be 110 x 320 ft. and is estimated to cost about $125,000, including equipment. Contract has been let to Huntley & Derdenger, Electric Building, Buffalo.

The Pattern Mfg. Corporation, 528 Amherst Street, Buffalo, has made application to build a new two-story plant, 30 x 80 ft., on property recently acquired at 5-15 Newfield Street, for the manufacture of metal patterns. All machinery will be electrically operated. E. J. Sylvester is president.

The Buffalo Steel Car Co., 422 Fidelity Building, Buffalo, is considering a list of machine shop equipment to be installed in its proposed one-story plant at Walden Avenue and the city line, 80 x 300 ft. Robert H. Parks is president.

H. H. Franklin, president Franklin Automobile Co., Syracuse, N. Y., has denied the report that negotiations are under way between the Franklin company and the Ford Motor Co., Detroit, relative to a working agreement or deal of any kind. It has been reported, as well, that the Ford company is planning the erection of a new assembling plant at Syracuse.

The Telometer Mfg. Co., Binghamton, N. Y., has been incorporated with a capital of $200,000 by R. H. and E. R. Slagle, and F. J. Mangan, Binghamton, to manufacture measuring instruments for automobile use, automobile parts, etc.

The Neu-Metal Products Corporation, Binghamton, has been incorporated with a capital of $15,000 by H. H. Hathaway, F. E. Spawn and A. Howard, Binghamton, to manufacture special metal goods for automobile service.

The Louis Smith Iron & Metal Corporation, Buffalo, has filed notice of dissolution under State laws.

The Hornell Electric Co., Hornell, N. Y., has been granted permission to construct a new electric power plant at Hornellsville.

The Hornell Repair & Construction Co., Hornell, N. Y., is planning for the installation of equipment at its plant to cost in excess of $50,000.

The Curtiss Aeroplane & Motor Corporation, Elmwood Avenue, Buffalo, has filed notice of a change in active capital to $6,978,100.

Joseph T. Ryerson & Son, West Sixteenth Street, Chicago, have awarded a contract to the Lackawanna Bridge Co., Bell and Abby streets, Buffalo, for the erection of a new local building, one-story, 50 x 100 ft.

The Thomas Flexible Coupling Co., Dunkirk, N. Y., has taken bids for a new one-story, brick and steel plant, 40 x 200 ft., to cost about $50,000.

The Auto Glass & Mirror Co., Jefferson and Superior streets, Buffalo, has filed application to operate a works in a two-story building, 60 x 120 ft., previously occupied by the Buffalo Engine Co. The equipment will comprise grinding machines, smoothing machines and polishing machinery, all electrically operated. Joseph N. Steenmans is president.

The Jamestown Car Parts Mfg. Co., Jamestown, N. Y., has increased its capital from $100,000 to $500,000.

Fire, Oct. 31, caused by an explosion at the power plant of the Niagara Falls Power Co., North Tonawanda, N. Y., destroyed a portion of the structure with loss estimated at $80,000.

The Skahen Steel Co., Syracuse, N. Y., has filed notice of dissolution under State laws.

The Peerless Stoker Co., Westfield, N. Y., has been incorporated with a capital of $125,000 by W. E. Smith, W. G. Moffatt and J. F. Steinbronner, to manufacture stokers.

The Diepress Co., Cazenovia, N. Y., manufacturer of stamped goods, is taking bids for a new one and two-story plant, 60 x 160 ft., to cost about $100,000.

The Welded Wheel Co., Boston, will begin erection of the first building of a reinforced concrete plant in North Tonawanda, N. Y., within a few weeks.

New England

BOSTON, Nov. 8.

The machine tool trade is marking time, business the past week being almost at a standstill. The General Electric Co., West Lynn, Mass., which has been the mainstay of this market for months, has purchased only a 5-ft. Cincinnati Bickford radial drill and a universal No. 3½ horizontal boring machine. It is the general opinion among banking interests that business will not improve until the money situation grows easier.

Metal-working tool prices generally are unchanged, but some weak spots are beginning to appear on special equipment. For instance, the price on one make of spline milling machines has dropped $320, and a sizable reduction on other milling equipment and on one centering machine is announced. Where there has been open competition for single tools, representatives in some instances have also shown a willingness to cut prices 10 to 12 per cent. Requests for cancellations have decreased the past week, possibly because manufacturers have been more prompt in making deliveries. Many New England machine-tool builders are operating on reduced schedules or have closed their plants. Some used machinery dealers report more prospective customers looking around the market for the purpose of testing it, but no increase in actual transactions is noted.

Next week the receivers of the Nelson Blower & Furnace Co., Elkins Street, South Boston, tractors, special machinery, etc., will sell the plant equipment at public auction. The sale involves about 600 machine tools, some in excellent condition, in addition to other mechanical equipment and seven tool cribs well supplied with small tools. Prospective buyers are inspecting the equipment this week.

Bids are being received for the construction of a two-story, 90 x 300 ft. garage on Boylston Street, for E. G. Isenbeck, 120 Milk Street., Boston.

The Coto-Coil Co., Providence, R. I., has purchased a building at 87 Willard Avenue, where a wide variety of coils will be made.

The American Insulator Co., New Freedom, Pa., has purchased property at Norwalk, Conn., on which it proposes to erect a two-story plant which will give employment to about 500.

The United States Electric Co., New London, Conn., electric heating forges and electric hot water heaters, has purchased the plant in which it has been conducting experimental work for some months.

The Bryant Electric Co., Bridgeport, Conn., is building a four-story and basement addition, 60 x 128 ft., to its plant on State Street and a four-story, 60 x 159 ft., addition with wing, 60 x 66 ft., to its works on Organ Street.

The former plant of the Bullard Machine Tool Co. on Broad Street, Bridgeport, Conn., recently acquired by the Underwood Typewriter Co., Hartford, Conn., is being overhauled and the installation of equipment probably will be well under way before Jan. 1.

The Somerset Stove Foundry, Somerset, Mass., has awarded contract for a one and two-story foundry to cost approximately $50,000.

The New Bedford Shuttle Co., New Bedford, Mass., which recently sold its plant at the corner of Elm and Bethel Streets to the Weedeh Mfg. Co., is contemplating the erection of a three-story building. Arthur C. Seabury is manager.

Work on the one-story machine shop for the Montague Machine Co., Montague, Mass., is progressing. According to the plans about 35,000 sq. ft. of floor space is provided.

The Bureau of Yards and Docks, Washington, is asking for bids on a 50-ton steam locomotive jib crane to be installed at South Boston, specification No. 4263.

A. E. Fish & Co., 8 Elm Street, Keene, N. H., manufacturers of metal screens, etc., have plans under way for a three-story addition, 40 x 60 ft., to cost about $22,000.

The Standard Oil Co., 26 Broadway, New York, has filed plans for a five-story automobile service and repair building, for company trucks and cars, at Monroe and Fifth streets, East Cambridge, Mass. It will be 20 x 138 ft., and is estimated to cost about $250,000.

The Arrow Electric Co., Hartford, Conn., manufacturer of electrical switches, etc., has perfected plans for a brick and steel addition, 33 x 40 ft.

The Millers Falls Mfg. Co., Millers Falls, Mass., manufacturer of tools, has filed plans for a two-story, brick addition to its plant at West Haven, Conn.

The Conroy Motor Co., 671 Main Street, Worcester, Mass., has completed plans for a two-story automobile service building and repair works, 90 x 150 ft., on Wellington Street, to cost about $100,000, including equipment.

The E. A. Bliss Co., Meriden, Conn., manufacturer of plated goods, has changed its name to the Napier-Bliss Co.

The Allen Shade Holder Co., Boston, Mass., has been incorporated with a capital of $50,000 by E. J. and E. M. Allen, and John L. Montgomery, all of Stoneham, Mass., to manufacture shade holders and other metal goods.

O. S. Bickford, Greenfield, Mass., has organized a company to manufacture special machinery, tools, etc., and has acquired the building formerly occupied by the Arrow Mop Co., Norwood Street, for initial works. B. M. Switzer, formerly proprietor of the Brattleboro Machine Works, Brattleboro, Vt., is also interested in the new company.

The Bridgeport Hardware Mfg. Co., Bridgeport, Conn., has filed notice of change in its corporate charter with capital of $800,000.

The Logical Auto Repair & Machine Works, Providence, R. I., has filed notice of organization to operate a plant at 97 Colfax Street for machine repair work and parts manufacture. George L. Perreault, 60 Howard Street, heads the company.

The C. J. Root Co., Bristol, Conn., manufacturer of registering machinery, brass hinges, etc., has increased its capital from $150,000 to $300,000.

The N. D. Cass Co., Athol, Mass., manufacturer of toys, is planning the erection of a new two-story factory at Manchester, Vt., 30 x 100 ft., to cost about $18,000.

The State Hospital Department, Boston, has arranged for the erection of a new one-story and basement power plant, 57 x 137 ft., at the State Hospital, Danvers, to cost about $55,000.

The Cunningham Magneto Co., Spencer, Mass., has been incorporated with a capital of $200,000 by Richard H. Cunningham, Charles N. Prouty and Rudolph Banncel, to manufacture magnetos and ignition equipment for automobile service.

The Plaza Electric Co., Bridgeport, Conn., has been incorporated with a capital of $50,000 by Samuel Bernstein, A. A. Nelson and F. M. McCue, 56 Sherman Street, Bridgeport, to manufacture electrical specialties.

The United States Screw Co., 26 Baker Street, Worcester, Mass., has been organized to manufacture screws, bolts, etc. Henry Beland heads the company.

The National Automobile Parking Co., 15 Temple Street, Springfield, Mass., has plans under way for a new service and repair works on Dwight Street, five stories, 100 x 200 ft., to cost in excess of $300,000.

The Waterbury Body Co., Thomaston, Conn., manufacturer of automobile bodies, has increased its capital from $25,000 to $60,000.

The M-B Tool Co., Providence, R. I., has increased its capital from $30,000 to $80,000.

The Thomas Smith Co., Worcester, Mass., manufacturer of bolts, nuts, etc., has perfected plans for a one-story addition, 34 x 62 ft., to cost about $13,000.

Cincinnati

CINCINNATI, Nov. 8.

The local machinery market continues dull. Now that the elections are over, there is a tendency on the part of all branches of industry to again settle down to business, but many people are of the opinion that no improvement will be seen for some time. There seems to be a fair demand for machine tools, but actual purchases are being held up in

the expectation of lower prices. Local manufacturers insist, however, that there will be no lower levels until costs are reduced. Reports are current of price cutting on some makes of machine tools, but so far as local manufacturers are concerned, these are declared to be without foundation. A large Eastern manufacturer of boring mills is said to have reduced prices approximately 15 per cent.

Some railroad buying was reported the past week. The Santa Fe purchased two lathes in this market, and may close on five more. The Big Four has sent out a list of two engine lathes, five boring mills, one coach wheel lathe, one bolt cutter and one 36-in. cold saw, motor driven, for its Beech Grove, Ind., and Mattoon, Ill., shops.

The Goldsmith Metal Lath Co., Central Avenue, Cincinnati, will increase its capitalization from $25,000 to $100,000 and is contemplating the erection of a new plant. Max Goldsmith is president.

The Williamson Heater Co., Cincinnati, has awarded to the H. K. Ferguson Co. the general contract for an addition to its foundry in the Oakley section. It will be one story, 60 x 120 ft., and will cost approximately $50,000.

The American Blower Co., which recently purchased the foundry of the Lane & Bodley Co., Tennessee Avenue, Cincinnati, will expend $100,000 in alterations and new equipment. It is expected that the plant will be in operation shortly after the first of the year and will employ 250 men.

The John H. McGowan Co., manufacturer of steam and power pumps, Cincinnati, has abandoned temporarily its plans for a new factory in the Oakley district and has purchased property adjacent to its plant on Central Avenue, on which it proposes to erect a three-story concrete building, 100 x 100 ft., at an approximate cost of $100,000. Plans are being prepared by Tietig & Lee.

The Wadsworth Electric Co., Covington, Ky., has been authorized to increase its capitalization from $200,000 to $500,000. No announcement as to the intentions of the company has been made, other than that the increased capitalization was necessary to take care of expanding business.

The Monarch Foundry Co., Lima, Ohio, has been incorporated with a capitalization of $5,000 by F. C. Dempster, F. A. Smith, J. H. Davison and D. Dawson.

The Dayton Light & Power Co., Dayton, Ohio, will issue bonds in the sum of $1,000,000 to finance extensions to its plant. It has purchased the plant of the Wise-Schieble Power Co., and the service lines will be connected to the Dayton Co.'s transmission lines. Surplus machinery will be disposed of.

The Everwear Mfg. Co., Springfield, Ohio, manufacturer of playground apparatus, has increased its capitalization from $25,000 to $50,000. John J. Hoppes is president.

The Gartland-Haswell-Rentschler Co., Dayton, Ohio, will erect a reinforced concrete craneway, sand storage bins, mixing house and elevated coke and iron storage floors at its Keowee Street foundry. A 10-ton traveling crane, with 60-ft. span, will be installed. Frank Hill Smith, Inc., is the engineer in charge.

The Buckeye Iron & Brass Works, Dayton, has purchased the four-story building at 24 South Canal Street, now occupied by the Horn Leaf Tobacco Co., and will move into it after alterations are made.

The W. E. Lamneck Co., Columbus, Ohio, manufacturer of furnaces, heating and ventilating plants, is taking bids on a new factory, 120 x 204 ft., adjoining its present plant. Construction will begin immediately after the contract is let.

Indiana

INDIANAPOLIS, NOV. 8.

The Noble Tire & Rubber Co., Kendallville, Ind., will soon take bids for its proposed two-story automobile tire manufacturing plant, 50 x 200 ft., to cost $75,000. O. W. Woodward is president.

The Wawasee Tire & Rubber Co., Elkhart, Ind., has taken bids for its new four-story plant, reinforced-concrete and steel, 175 x 175 ft., to cost about $500,000, including machinery.

The Mutual Motor Truck Co., Sullivan, Ind., manufacturer of automobile trucks, has broken ground for its one-story addition, 200 x 800 ft., estimated to cost about $400,000. Robert E. Petrie is president.

The Evansville Enameling Co., Evansville, Ind., is having plans prepared for a new one-story factory, 25 x 80 ft., to cost about $25,000. Gilbert H. Karges, 305 Furniture Building, is architect.

The Engman-Matthews Range Co., Emerick Street, South Bend, Ind., manufacturer of stoves and ranges, is having plans prepared for a one-story addition to its foundry at Goshen, Ind. H. A. Engman is head.

The Universal Slag, Brick & Tile Co., affiliated with the Silico Brick & Tile Co., West Fifty-ninth Avenue and Sixty-sixth Street, Chicago, will take bids early in January on revised plans for its new plant at Gary, Ind., one-story, 100 x 140 ft., estimated to cost about $200,000, with machinery. Joseph M. LeVee, 673 Broadway, Gary, is supervising architect.

The Terre Haute Tire & Tube Co., Terre Haute, Ind., has increased its capital stock from $15,000 to $90,000.

The Diamond Veneer Co., Shelbyville, Ind., contemplates building two additional plants to cost $500,000.

The Acme Works, Harding Street and the Pennsylvania Railroad, Indianapolis, has started work on a brick foundry to cost $27,000. It manufactures aluminum castings.

The Commercial & Experimental Machine Co., Indianapolis, has increased its capital stock from $65,000 to $500,000.

The Auto Farm Light Co., Indianapolis, has been incorporated with $150,000 capital stock to manufacture farm lighting machinery. The directors are Jack D. Oldham, 130 North Gladstone Avenue; Ora L. Kestle and Vane B. Korner.

The Claypool Foundry Co., Claypool, Ind., has been incorporated with $50,000 capital stock to make castings and carry on a general foundry business. The directors are Frank O. Borg, A. J. Humely and E. A. Miller.

Pittsburgh

PITTSBURGH, NOV. 8.

It is doubtful if the machinery trade in this district has experienced as quiet a week as the past one in several years. While crane builders have made quotations on a number of inquiries, nothing important has developed and the general explanation is that buyers are satisfied they will be able to place their requirements at lower prices and are inclined to withhold orders. Business in machine tools is quiet for the same reason; in fact, buyers are exerting considerable pressure for lower prices. It is asserted that the high cost of castings is one of the prime reasons for the high prices which have prevailed for machine tools, and that any substantial reduction in machine tool prices will have to be preceded by lower prices for castings.

The Westinghouse Electric & Mfg. Co., East Pittsburgh, has acquired the plant and property of the Independent Lamp & Wire Co., Rochester, Pa., for the production of repair parts and the manufacture of micarta materials, used for airplane propellers and insulators.

The Aluminum Co. of America, Pittsburgh, has arranged for a note issue of $12,000,000. Arthur V. Davis is president.

The Pittsburgh Track Mfg. Co., 609 Neville Street, Pittsburgh, has had plans prepared for a new one and two-story shop, 100 x 100 ft., at Forty-fourth Street and the Pennsylvania Railroad.

S. Hausman & Sons Co., Pittsburgh, has been incorporated with a capital of $100,000 to manufacture iron and steel products. Benjamin Hausman, 720 North Negley Avenue, is treasurer.

Heyl & Patterson, Inc., 51 Water Street, Pittsburgh, manufacturer of elevators, hoists, etc., has acquired property at First Avenue and Short Street, 80 x 240 ft., for about $200,000. It will be used for a new two-story plant, contract for which was recently let, to cost $60,000.

The Lee C. Moore Rig-Building Co., Pittsburgh, is being organized by E. L. Whitney, Newton Chapin and C. R. Krause, to manufacture oil drilling rigs, derricks, towers, etc., and parts. Application will be made for a State charter. Joseph C. Bily, 435 Oliver Building, represents the company.

The Carleton Mining & Power Co., Kingwood, W. Va., recently organized is considering plans for a new electric power house. In connection with its mining operations it will purchase considerable machinery, cars, rails, etc. Carleton C. Pierce is president.

The Englert Mfg. Co., Pittsburgh, has leased the first floor of the Graham Building, at Carson and South Twenty-Second streets, for the manufacture of automobile parts and accessories.

The Pittsburgh Forge & Iron Co., Chamber of Commerce Building, Pittsburgh, has called a special meeting of stockholders on Dec. 14, to approve an increase in capital from $300,000 to $600,000. W. I. Miller is secretary.

The Detroit Rayc Sales Co., Pittsburgh, has been incorporated with a capital of $50,000 by Henry Bluestone, Charles T. Offerman and Harry P. Letwin, Pittsburgh, to manufacture welding machinery.

The Pittsburgh-Erie Saw Co., 55 Water Street, Pittsburgh,

manufacturer of saws, has acquired the three-story building at Liberty Avenue and Fisk Street, on site 100 x 153 ft., for extensions. The price is stated to be $62,500.

Following its recent capital increase from $50,000 to $100,000, the Wheeling Machine Products Co., Twentieth and Main streets, Wheeling, W. Va., is planning for extensions in its departments for the manufacture of automatic screw machinery and turret lathe specialties. E. W. Krause is general manager.

The Mountain State Coal Co., Huntington, W. Va., is contemplating the erection of a new one-story power plant at its properties at Ritter, W. Va. C. T. Benton is president, and G. E. Cary, Huntington, consulting engineer.

The Four Vein Coal Co., Lanark, W. Va., recently organized with a capital of $200,000, is planning for the installation of a power plant at its properties. C. M. Lilly is president and manager.

The Twelfth Street Garage, Inc., Wheeling, W. Va., recently organized, has plans under way for a new automobile service and repair building, 100 x 135 ft., to cost $200,000. C. A. Vaden is president, and H. S. Bradley, vice-president.

The Exacto Batter Machine Co., Connellsville, Pa., has been incorporated with a capital of $20,000 to manufacture machinery and parts. A. R. Kidd, Connellsville, is treasurer.

Philadelphia

PHILADELPHIA, Nov. 8.

The F. J. Stokes Machine Co., Seventeenth and Cambria streets, Philadelphia, has awarded a contract to John N. Gill & Co., Otis Building, for a new one-story plant, 91 x 140 ft., on Tabor Avenue, in the Cedar Grove section.

The Cadillac Motor Co., Philadelphia, has leased the four-story brick and steel factory at Twenty-third and Locust streets. Extensions and improvements will be made to cost about $50,000.

The A. Taylor Co., Philadelphia, has been incorporated with a capital of $100,000, to manufacture metal products, structural iron, etc. A. P. Goldsmith, 7110 Chew Street, is treasurer. Headquarters of the company are in the Commonwealth Building, and plans have recently been perfected for a new one-story plant, 60 x 200 ft., on Cedar Street, Kensington.

Following the rejection of the two bids received for the purchase of the Hog Island shipyard, Philadelphia, the United States Shipping Board, Washington, has announced its intention of again offering the property for sale in the near future. In the event that bids received on the second call are still unsatisfactory, the board is planning to entertain proposals for leasing the yard. If the property is still in the hands of the Government next February, it will probably be closed awaiting disposal.

Fire, Nov. 2, destroyed a portion of the works of the Crown Automobile Painting & Repairing Co., 1406-14 Vine Street, Philadelphia, with loss estimated in excess of $75,000.

The Belmont Iron Works, Twenty-second and Washington streets, Philadelphia, has filed plans for the erection of a one-story addition, 43 x 65 ft., on West Twenty-second Street.

The Jefferson Brass Foundry & Mfg. Co., Philadelphia, is being organized by Samuel and Morris Siegel, and Abraham Savin, to manufacture brass, bronze and other metal castings. Application will be made for a State charter. Ellis Rudman represents the new company.

The Pennsy Tool Co., 232 Ionic Street, Philadelphia, has filed notice of dissolution under a partnership between L. S. Hood and Ernest B. Odgers. It is the intention of the latter to continue the business individually, under the present name.

The Morris Truck & Wheel Co., Seventy-fifth Street and Island Road, Philadelphia, has taken bids for two one-story buildings at Forty-second Street, near Woodland Avenue, 50 x 80 ft., and 50 x 80 ft. The first noted will be equipped for general iron-working and the latter as a foundry.

Stephen's Garage, Inc., Northampton, Pa., recently incorporated with a capital of $50,000, has acquired a local building for its proposed new works. A machine shop will be installed for repair work, which will later be extended to manufacture parts, radiators, and kindred specialties. It is expected to extend the present building for this purpose. Stephen Friesch is manager.

The Smith-Waring Corporation, 313 Market Street, Harrisburg, Pa., manufacturer of tractor-cultivators for farms, will equip its new plant on South Cameron Street for an initial production of 25 tractors per day, including machining and assembling departments. Preliminary plans are under way for the erection of nine-story addition, totaling about 160,000 sq. ft., to allow for an output of about 200 tractors per day. Henry Waring is president.

The Hunter Motor Car Co., Harrisburg, Pa., recently organized, has removed its temporary plant at 78 South Cameron Street to its new site, near White Hill. The first unit of the new plant has been completed to allow operations, and production of the new automobile designed by the company will be placed under way at once. Plans have been prepared for additional buildings to form other units.

The Wandless & Scott Engineering Co., Philadelphia, is being organized by Franklin W. Wandless, Francis H. Scott and Henry K. Fort to manufacture heating equipment and systems. Application will be made for a State charter. Ralph N. Kellam, 1101 Stephen Girard Building, represents the company.

A power house, 50 x 50 ft., to cost about $40,000, will be erected by the Harbison's Dairies, Inc., Front and Diamond streets, Philadelphia, at its new plant at Hunting Park and Torresdale avenues.

The T. B. Wood's Sons Co., Chambersburg, Pa., manufacturer of pulleys, hangers, etc., has arranged for the erection of a one-story building, 50 x 150 ft.

The Fox Motor Car Co., Philadelphia, advises that the building it is erecting will cost about $400,000, and an expenditure of over $500,000 will be made for equipment. Construction is well under way.

Detroit

DETROIT, Nov. 8.

The local machine tool market continues at a standstill, buyers apparently waiting for further price reductions. A slight increase in inquiries has been noted the past few days, but none for large lots and no orders have been booked. A better feeling is prevalent, however, owing to the improvement in the automotive situation and business is expected to pick up in the next few weeks.

The General Spring & Wire Co., Detroit, will soon start work on a new plant, one story, 250 by 200 feet, to cost approximately $175,000.

The plant of the Benton Harbor Auto Machine Co., Benton Harbor, Mich., was destroyed by fire a few days ago, with an estimated loss of $200,000, with $160,000 covered by insurance. The Benton Harbor Malleable Castings Co. lost about $25,000 to $50,000 in castings, and the Crary Machine Works suffered a loss of $2,000. The Auto Machine company's plant will be rebuilt at once.

The Allen Screen Co., Detroit, will build a one story plant, 48 x 96 ft., costing about $10,000.

The Vulcanizing Machine & Supply Co., Jackson, Mich., recently incorporated at $25,000 to manufacture vulcanizing machines, is looking for a factory location.

The Stearns Register Co., Detroit, has completed plans for the erection of a factory, one story, 100 x 180 ft.

The Sauzedde Corporation, Mount Clemens, Mich., will erect a new one story plant unit, 100 x 150 ft., to cost about $75,000.

The Morse Chain Co., Ithaca, N. Y., has opened a branch factory at the corner of Eighth and Abbott streets, Detroit, which will be devoted exclusively to the manufacture of Morse automobile silent chain sprockets and the Morse adjustment. Its sales and engineering offices have been removed from 1003 Woodward Avenue to the new factory.

The Michigan Wire Fence Co., Adrian, Mich., will erect an addition to cost about $4,000.

The Tiede Clock Co., of Muskegon, Mich., will build an addition to cost about $5,000.

The Reo Motor Car Co., Lansing Mich., expects within 60 days to have its plans complete for changing its production system, whereby the present output will be increased by at least 20 per cent. All buildings and additions that have been under way for many months will be completed at that time. New electrical equipment will be placed for motor testing.

The Oakwood Mfg. Co., Detroit, has been incorporated with a capital of $30,000 by Floyd S. Miven, Albert K. Lally and Albert B. Stone, 551 Cadillac Avenue, to manufacture metal products.

The Nelson Motor Truck Co., Saginaw, Mich., manufacturer of motor trucks and parts, has increased its capital from $500,000 to $1,100,000.

The Howell Foundry Co., Detroit, has been incorporated with a capital of $67,000 by Claude E. Stowe, Francis T. Schreiner, Jr., and Charles A. Kanter, 99 Merrick Avenue, to manufacture iron, steel and other metal castings.

The Wilson Foundry & Machine Co., Pontiac Mich., has increased its capital from $5,000,000 to $6,600,000.

The Clarage Fan Co., Kalamazoo, Mich., manufacturer of fans, blowers, and other mechanical draft equipment, has awarded a contract to Moore & McQuigg, Eleanor Street, for a two-story addition, 65 x 120 ft., to cost about $25,000. The company is now completing an addition to its works, to cost about $150,000, and all miscellaneous contracts have been let.

The Soo Handle & Enameling Co., Sault Ste. Marie, Mich., has been incorporated with a capital of $100,000 by I. R. DuRoy, R. G. Ferguson and N. S. Mackie, to manufacture enamelware products, handles, etc.

The Draper Mfg. Co., Port Huron, Mich., manufacturer of steel and brass balls, etc., has increased its capital to $40,000.

The Lansing Stamping & Tool Co., Lansing, Mich., has changed its name to the Lansing Stamping Co., with a capital of $40,000.

The B-J Steam Gas Generator Co., Grand Rapids, Mich., has been incorporated with a capital of $50,000 by Conrad S. Johnson, John E. Best and M. J. Palities, to manufacture special generating machinery and parts.

Cleveland

CLEVELAND, NOV. 8.

The volume of machine-tool business continues light. The Trumbull Steel Co., Warren, Ohio, is inquiring for several machines, including a 36-in., 18-in. and 17-in. lathe, 24-in. shaper and a few smaller tools. Some other inquiries have developed, but as a rule are for small lots and have not resulted in the early placing of orders. Single inquiries include two large boring mills and about a half-dozen 36-in. and 42-in. lathes. A very limited amount of business is being placed in single machines, mostly in small sizes and usually buyers want the lower priced types or used machines.

Various reasons are given by prospective purchasers for delaying the placing of orders, but the most common is that they are waiting for prices to go down. The Monarch Machine Tool Co., Sidney, Ohio, has reduced prices 20 per cent on its line of lathes, but with this exception no late price changes are reported. While it is expected that lower quotations would cause a little stimulation in the market, manufacturers and dealers do not believe there can be much of a revival in buying until basic conditions change.

A few orders are coming from South America and Japan.

The Cleveland Can Co., recently incorporated with a capital stock of $2,500,000, has purchased the plant of the Louisville Novelty Co., Louisville, Ohio, and will convert it into works for the manufacture of tin cans. It has taken options on four other locations and expects to buy considerable equipment within the next few weeks for these proposed plants, mostly automatic can-making machinery. The company expects to have eight plants in all, including a large factory to be erected in Cleveland next year. Walter T. Findley is president; J. A. Brown, vice-president; H. C. Koontz, treasurer; H. O. Spalding, secretary, and E. Parsons, treasurer. The offices are in the Union Building, Cleveland.

C. F. Adamson, president Adamson Mfg. Co., East Palestine, Ohio, is planning the erection of a new building for the manufacture of electrically welded steel products, adjoining the present plant.

The Canton Safety Device Co., Canton, Ohio, recently organized to manufacture a safety wheel guard for railroad cars, has increased its capital stock from $50,000 to $500,000. It will not erect a factory at present, but will have its product manufactured in other plants. O. P. Aughinbaugh is president; W. Cantlon, vice-president, and W. F. Mertens, secretary and treasurer.

The Colonial Foundry Co., Louisville, Ohio, is enlarging its plant by the erection of a brick and steel addition, 60 x 165 ft., and will add a 72-in. cupola and install a 10-ton traveling crane. The capacity will be increased 150 per cent. It has increased its capital stock from $50,000 to $235,000 to provide for the extensions.

The plant of the Fabricated Iron & Steel Co., Leetonia, Ohio, manufacturer of steel tanks, was burned a few days ago.

The Accurate Machine Co., Cleveland, is erecting an addition, 60 x 180 ft., to its Coit Road plant. It will be used largely for the manufacture of bushings, the company having recently sold its bushing plant at 5320 St. Clair Avenue.

The Cleveland Steel Barrel Co., 9612 Meech Avenue, Cleveland, has placed contract for a one-story extension, 60 x 120 ft.

The Cyclone Fence Co., East Fifty-fifth Street, Cleveland, has awarded contract for a one-story addition, 60 x 80 ft.

The Elwell-Parker Co., Cleveland, manufacturer of electric trucks and tractors, has purchased the plant of the Foote-Burt Co., 4101 St. Clair Avenue, adjoining its factory, and will consolidate its operations in the two plants, increasing its capacity 40 per cent. It is also erecting a two-story office building 40 x 120 ft.

The Cleveland Tap & Mfg. Co., of which A. W. Worden is manager, has established a plant in a building at Twenty-second Street and Payne Avenue, occupied by the Brierley Machine Co. and will manufacture a line of taps.

The Locke Machine & Mfg. Co., has moved to new quarters on East Forty-ninth Street, near Superior Avenue, in a building formerly occupied by the Foote-Burt Co. as a branch plant.

Chicago

CHICAGO, Nov. 8.

Although the market is still quiet, there is evidence that sentiment took a turn for the better following the Presidential election. Store trade particularly has shown improvement, quite a number of sales having been made from the floor within the past few days. Individual transactions as yet involve one or two machines, but in the case of one dealer sales of turret lathes, high-speed drills, a thread miller and a radial drill in the three days following the election represented a total of $42,000. In addition, three machines were sold off the floor, two of which were second hand, amounting to $1,750. Pending lists, particularly those issued by the railroads, are still held in abeyance and it is possible that this is accounted for by a feeling that lower prices are in sight. This sentiment among consumers is still a factor in the market; yet the extreme conservatism, which for several weeks cut off practically all buying, has disappeared and purchases of single machines for which there is an immediate need are being resumed.

Price reductions have been announced by few machine tool manufacturers selling in this district. A line of medium-priced engine lathes has declined 20 per cent, internal grinders 10 per cent, boring mills 16 per cent, multiple drills 16 per cent. Whether general reductions will develop is still a disputed question, but it is argued that there is no longer any incentive for buyers to postpone purchases because in most cases they are protected by guarantees against declines.

Collections are still difficult and requests for suspensions and cancellations are being received, but unless the current tendency toward a resumption in interest in new equipment is a mere flash in the pan, the market is on the road to improvement.

The Splitdorf Electrical Co., manufacturer of spark plugs and ignition apparatus, Newark, N. J., is having plans prepared for a six-story factory, 120 x 300 ft., on Twenty-second Street, near Fifty-fourth Avenue, Cicero, Ill., to cost $700,000.

The Haskell & Barker Car Co., Michigan City, Ind., is having plans drawn by Frank D. Chase, Inc., Chicago, for a one-story foundry at Fourth Street and Wabash Avenue, Michigan City, to cost $80,000.

The Bowman Dairy Co., 150 West Ontario Street, Chicago, has let contracts for a one-story boiler house, 50 x 60 ft., at 6624-26 Wentworth Avenue, to cost $20,000.

The Narowetz Heating & Ventilating Co, 223 West Lake Street, Chicago, has purchased a site, 82 x 132 ft, at 1711-17 Park Avenue, where work will start at once on a two-story factory and office building to cost $40,000.

The Rhy-Bon Electric Co., 538 West Madison Street, Chicago, has been incorporated with $5,000 capital stock by F. L. Rhyndress, O. J. Clusman and Tillman Bond to manufacture electrical supplies.

The Forest City Foundry Co., Rockford, Ill., has obtained a permit to construct a $6,000 addition to its new plant now building at Harrison Avenue and Ninth Street. The addition will be used as a core room.

The E. A. Koeneman Electric Co., Inc., 214 Collinsville Avenue, East St. Louis, Ill., has been incorporated with $20,000 capital stock by Albert G. Ziesk, Charles C. Koeneman and C. H. Chapline to manufacture machinery and mechanical devices.

The Capital Lampagraph Co., St. Louis, will move its main offices to Chicago and locate its plant at Indiana Harbor, Ind. The company is incorporated with $500,000 capital stock and manufactures the Capital lampagraph, a combination electric lamp and phonograph, electrically operated.

The Oliver Chilled Plow Works, South Bend, Ind., has asked for building permits to erect five additional factory units north and south of a recently completed forge shop. They will include an assembling building, paint shop, clean-

ing building, a warehouse and a plant for the manufacture of tractor plows.

The Chicago, Indianapolis & Louisville Railroad contemplates the construction of car repair shops at Lafayette, Ind. It is also receiving bids on a car repair shop at Bloomington, Ind., to cost $35,000.

The Judy Mfg. Co., manufacturer of mine car wheels, Centerville, Iowa, has completed a new foundry equipped with an open hearth furnace.

The Modern Foundry & Mfg. Co., 3153-61 Hiawatha Avenue, Minneapolis, commenced operations in its gray iron foundry on Nov. 1, with a daily output of about seven and one-half tons. Officers and directors of the company include L. J. Bedard, R. Lloyd-Jones, C. E. McLaughlin, Sumner T. McKnight, Robert Webb and S. O. Abram.

The Road Metal & Supply Co., manufacturer and distributor of road machinery and supplies, Topeka, Kan., has increased its capital stock to $200,000.

The American Manicop Typewriter Co., Chicago, manufacturer of typewriters and parts, has increased its capital from $2,500,000 to $10,500,000.

The City Council, Taylorville, Ill., will soon call for bids for the erection of a municipal electric power plant. Plans have been prepared by W. S. Merkle, engineer, 129 Market Street, St. Louis. T. J. Downey is mayor.

The Findlay Disk Wheel Corporation, Chicago, manufacturer of steel wheels for automobile service, has filed notice of change of name to the Findlay Steel Wheel Corporation.

The H. Mueller Mfg. Co., Decatur, Ill., manufacturer of brass goods for gas, water and plumbing use, is taking bids for the erection of the superstructure of its one-story addition, 150 x 180 ft. Foundation work for the building is under way.

The Elgin Motor Car Co., Chicago, manufacturer of automobiles, has increased its capital from $3,500,000 to $5,500,000.

The Carney Cement Co., Mankato, Minn., has plans under way for the construction of a new plant on a site near the city, to cost about $150,000. The works, in addition to the main mill, will include machine shop, forge shop, and chemistry building. Richard K. Meade & Co., 11 East Fayette Street, Baltimore, Md., are engineers.

The Lawson Aeroplane Co., Chicago, manufacturer of airplanes, is planning for the construction of machines of larger type, and increased facilities are being considered. The company has the contract with the United States Post Office for carrying mail from Chicago to New York, and is now using machines of about 1 ton capacity, exclusive of passengers. Plans are also under way for the establishment of a landing field at Pittsburgh, to include hangars and shops for repair service, parts production, etc. A. W. Lawson is president.

Baltimore

BALTIMORE, Nov. 8.

Machinery and operating equipment to cost about $35,000 will be installed by the Duraflex Co., Baltimore, at its new plant on the Hollins Ferry Road for the manufacture of flooring specialties. It has options on property at this location and proposes to erect two one-story steel buildings to be ready for service soon after the first of the year. Ralph Bolgiano is president and treasurer, and J. F. Nachod, vice-president and general manager.

The Colonna Marine Railway Corporation, Maple Avenue, Berkley, Va., has awarded a contract to Nichols & Lindeman, Norfolk, Va., for the erection of a two-story, reinforced-concrete machine shop, 60 x 175 ft., to cost about $50,000.

The Wilmington Match Machine Co., Wilmington, Del., recently organized, is planning for the establishment of works to form the initial unit of a group of three factories. It will specialize in the production of a patented match manufacturing machine, designed by Alexander Kelley and his son, Edward M. Kelley, both of 3102 Market Street, and who will head the new company. Construction of models and parts has been under way at the plant of the Slocomb Machine Co.

Lyon, Conklin & Co., Inc., 13 Balderson Street, Baltimore, manufacturer of roofing and other sheet metal products, is having plans prepared by Howard Lyon, engineer, for its new plant at McComas and Donaldson streets. It is expected that bids for construction will be asked during the winter.

The National Utensils Mfg. Co., Inc., 310 East Lanvale Street, Baltimore, has been incorporated with $100,000 to manufacture cooking and heating supplies and equipment. The incorporators are Henry L. Mendal, Wilifrid De Mar and W. Edward Brockmiller.

The Metal Package Co., Brooklyn, N. Y., which recently took over the plant of the John Boyle Co., Baltimore, will make extensions and install machinery at an expenditure of about $200,000.

The Bowers & Bartlett Co., Inc., manufacturer of washing machines, has leased property at 1201 South Sharp Street, Baltimore, for a manufacturing plant.

The F. V. L. Smith Battery Co., Atlanta, Ga., recently organized, with a capital of $300,000, to manufacture electrical batteries, has plans under way for the erection of a factory. F. V. L. Smith is president.

David Stewart, Clio, S. C., is organizing a company to establish a local plant to manufacture agricultural implements. The initial works will consist of a machine shop and foundry and a list of equipment is being arranged.

The Simon Mfg. Co., Wilmington, N. C., has been incorporated, with a capital of $500,000, by W. Wells, Walter Penny and Harry Allen, to manufacture furnace grates and kindred equipment.

Fire, Oct. 31, originating in the power house at the plant of the Widemer Lumber Co., Wilmington, N. C., destroyed a large section of the works, including power department and machinery, with loss estimated at $100,000.

The Fisheries Products Co., Wilmington, N. C., is planning for the erection of a new fertilizer plant to cost in excess of $500,000, including machinery.

The Baxter & Allen Iron Works, Charleston, S. C., recently organized, is arranging for the installation of equipment in a local building for a boiler works and machine repair shop. Thomas B. Allen, 18 Atlantic Street, is president and treasurer.

The Piedmont Ice & Coal Co., Greensboro, N. C., is planning for the installation of new coal-handling machinery and will replace steam power at the works with electric service. The company recently increased its capital to $150,000. W. B. Ross is general manager.

The Morgan Oil & Fertilizer Co., Red Springs, N. C., is planning to rebuild its engine plant and other departments recently destroyed by fire with loss estimated at about $45,000. James A. Jones is president.

Milwaukee

MILWAUKEE, Nov. 8.

The machine tool trade appears to be in a state of suspense, with attention directed at the manufacturers' convention the latter part of this week, the results of which are awaited to furnish an index on prices. So far this month new business has been of light volume, buyers and sellers apparently being far apart on the price situation. The need for new tools is also much less urgent than at any time this year, as shops are still reducing operations. Milling machine makers have laid off some operatives, but are able to maintain production by higher efficiency of the men at work.

The General Railway Device Co., Racine, Wis., has been granted a charter to manufacture metal specialties for railroads. The incorporators are William H., William V., and John H. Osborne, all associated with the Osborne Foundry Co., Racine. The new company has a capital stock of $10,000.

The Yates & Johnson Mfg. Co., Chippewa Falls, Wis., which is building a new machine shop at a cost of $65,000 or more, with equipment, has increased its authorized capitalization from $25,000 to $100,000 to finance the enlargement. The corporate style also has been changed to Northlite Mfg. Co. It specializes in the manufacture of electro-generating units.

The Atlas Engineering Co., 3009-3021 Lisbon Avenue, Milwaukee, has plans for a new machine shop, 60 x 120 ft., with a two-story wing, 30 x 36 ft., to be erected at Thirtieth Street and Auer Avenue. Work probably will not begin until after March 1, however. The company manufactures concrete mixers, wagon loaders and other mechanical specialties. H. W. Zimmermann is president and general manager.

The Eastman Mfg. Co., Manitowoc, Wis., manufacturer of gasoline hose couplings and other brass specialties, has effected an increase in capitalization to finance the addition of an electro-galvanizing plant and nickel-plating equipment, as well as enlarging the capacity in general. The present capital consists of 500 shares of preferred stock with a par value of $100 and 750 shares of non-par value common stock. Joseph Eastman is president and general manager.

The Vollrath Co., Sheboygan, Wis., manufacturer of stampings and enameled utensils, has awarded contracts for a one-story stamping room addition, 80 x 200 ft., to cost about $100,000 with equipment. Construction began Nov. 1.

The Farm Motorizer Co., Racine, Wis., has been incorporated with an authorized capital of $250,000, to manufacture machinery, equipment and devices for agricultural purposes. The incorporators are James E. Shine, Leonard P. Baumblott

and H. J. O'Donnell. No further details have been made public.

The Badger Meter Mfg. Co., 841 Thirtieth Street, Milwaukee, has filed amendments to its corporate articles to increase the authorized capitalization from $50,000 to $150,000. It manufactures water meters and is planning to enlarge the capacity of its factory, which was erected three years ago. J. J. Leach is president and treasurer.

The Farmers Tractor Corporation, Stevens Point, Wis., has been incorporated with a capital stock of $500,000 by A. J. Patch, William Mainland and A. N. Stevenson, all of Oshkosh, Wis. It intends to erect a plant for the manufacture of tractors at Stevens Point early next spring. Tentative plans are in preparation. Mr. Patch formerly was chief engineer of the Hart-Parr Tractor Co., Charles City, Iowa.

The Hexmen Motor Co., Racine, Wis., organized a year ago to manufacture a patented device for internal combustion engines, has changed its name to the Ames Carburetor Co., and will enlarge its production to include carbureters and auxiliary appliances. Fred C. Haumerson is secretary and general manager.

The Bub Body Corporation, Milwaukee, has been incorporated with a capital stock of $50,000 by Elmer, Herbert and Arthur B. Zwebell, 482 Milwaukee Street, to manufacture automobile bodies, specializing in sport and speedster types. Plans have been prepared for a factory costing about $25,000 to be erected during the winter at Schleisingerville, near Milwaukee.

The Central South

ST. LOUIS, Nov. 8.

The Sieloff Packing Co., St. Louis, is in the market for equipment for a refrigerating plant.

The Gunther City Coke & Mining Co., Gunther City, Okla., has been incorporated with a capital stock of $1,000,000 by C. B. Cordes, Nowata, Okla.; E. Webb, Wichita, Kan., and W. H. Brown, Des Moines, Iowa, and is in the market for coal mining machinery, power plant equipment, etc.

The Isko Electric Co., Tulsa, Okla., has been organized with a capital of $100,000 by E. R. Kemp, R. H. Hardin and Edgar A. DeNeules.

The Missouri Car Co., St. Louis, A. Brewster, president, Central National Bank Building, will equip a plant for the manufacture of automobiles.

The Joplin Foundry Co., Seventh and Missouri streets, Joplin, Mo., has awarded contract to the Buckey Miller Engineering Co., Bartlett Building, for a one-story building, 50 x 50 ft.

The Murdock Hardware Co., Baxter Springs, Kan., has plans under way for a new one and two-story plant, 50 x 110 ft., fronting on the tracks of the Frisco Railroad.

The Durham Coal & Iron Co., Chattanooga, Tenn., is planning for the construction of a tipple at its coal properties at Bakewell, Tenn. It will also install mining machinery. The entire project is estimated to cost about $150,000.

The Western Kentucky Pipe Line, Producing & Refining Co., Bowling Green, Ky., is planning for the erection of a new refinery, with daily output of about 1500 bbl. Thomas W. Coyle is general manager.

The Kentucky Wagon Mfg. Co., Louisville, is having plans prepared for a one and four-story addition. D. X. Murphy & Brother, Louisville Trust Building, are architects.

A. L. Lamar, 1029 East Eighth Street, Pittsburg, Kan., is taking bids up to Nov. 15 for a new one-story plant on East Eighth Street to manufacture motor truck parts.

The Board of Public Service, St. Louis, has arranged for a new one-story power house, 65 x 80 ft., as an addition to the present plant.

The Looney-Elkhorn Coal Co., Regina, Ky., is planning for the erection of a new coal tipple at its properties.

The C. Nelson Mfg. Co., Twenty-third and Division streets, St. Louis, manufacturer of cabinets, etc., has awarded a contract to the Batterman Construction Co., 1943 St. Louis Avenue, for the erection of a two-story plant addition, 50 x 83 ft. J. L. Nelson is secretary and treasurer.

The Hays-Elkhorn Coal Co., Shelbiana, Ky., recently organized, is planning for the erection of a new coal tipple at its properties.

The Planters' Cotton Gin Co., Sayre, Okla., is planning for the rebuilding of its cotton gin, recently damaged by fire with loss estimated at $25,000.

The Wade Coal Co., Pikeville, Ky., recently organized, is planning for the construction of a tipple at its properties. W. J. Pinson is head.

California

SAN FRANCISCO, Nov. 2.

The Shell Oil Co., 343 Sansom Street, San Francisco, is arranging for extensions and improvements in its refinery at Martinez, Cal., to cost about $1,000,000, including equipment.

The Crellin Machine Co., Los Angeles, has been incorporated with a capital of $75,000 by Charles V. and M. S. Crellin, and Alphons Trinkaus, Los Angeles, to manufacture machinery and parts.

The Sims & Gray Iron Works, 156 Main Street, San Francisco, has filed plans for a one-story addition on Bryant Street.

The United States Electric Steel Production Co., San Francisco, is negotiating with the City Commission and Chamber of Commerce, Sacramento, Cal., for a site for a new plant. If suitable location can be found the company proposes to build a plant to cost in excess of $3,000,000, including a hydroelectric power plant.

Fire, Oct. 26, destroyed a building at the works of the Cook Spring Co., Williams, Cal., with loss estimated at $75,000.

The Lucey Mfg. Corporation, Los Angeles, manufacturer of pumps, engines, oil well machinery, etc., has increased its capital from $1,500,000 to $2,000,000.

The Reuter Brothers Co., Hayward, Cal., manufacturer of iron and steel castings, boilers, etc., has acquired property at San Jose, Cal., and will erect a new plant with large increased capacity.

The Pacific Gas & Electric Co., San Francisco, will begin work at once in connection with its new hydroelectric power plant at Spring Gap, near Oakdale, Cal. It will be constructed in different units, with the entire project estimated to cost about $5,000,000, including machinery.

The Berger-Carter Co., Hayward, Cal., manufacturer of canning machinery, has acquired a controlling interest in the National Axle Co. with plant at Industrial City, San Jose, Cal. The company will consolidate its works at this point and will remove its Hayward plant to the new location. At a later date the plant will be extended to include the manufacture of dehydrating equipment. Headquarters of the company are at 365 Market Street, San Francisco.

Catalogs Wanted

The consul general for Mexico, 519 California Street, San Francisco, desires catalogs of manufacturers of sawmill machinery and paper mill equipment for extracting oil from wood.

The Pacific Northwest

SEATTLE, Nov. 2.

The machine-tool market continues quiet, with limited demand for new equipment. Lumber mills, which are heavy buyers of machinery, are practically out of the market, due to a recent drop in lumber prices and increased freight rates.

The credit situation in this section is tightening and large industrial accounts are kept strictly to a 30 day collection.

Inquiries for steel products, which were fairly active 30 days ago, have shown a steady decline and the tendency is toward "watchful waiting" for the present.

The Lewiston Box Factory, St. Maries, Idaho, has purchased a site in Spokane, and will remove its plant to the new location. The capacity will be enlarged and new equipment installed. D. J. Wilson is general manager.

The Barde Industrial Co., 24 West Connecticut Street, Seattle, which purchased the No. 1 plant of the Skinner & Eddy Shipbuilding Co., is offering for sale, motors, bridge and locomotive cranes, lathes, electric winches and hoists, compressors, grinders, pipe machines, bolt threaders, air and electric drills, drill presses, and other miscellaneous items.

H. H. Bryant & Son, Boise, Idaho, will erect an assembling plant for Ford cars, employing about 100 men. Parts will be shipped direct to the factory for assembling.

The Sanford Friction Thresher Co., Centralia, Wash., has completed work on the first unit of its factory and construction will begin immediately on a second unit. A. C. Sanford is president.

The Shaw-Bertram Lumber Co., Klamath Falls, Ore., plans the construction of a sawmill on Lake Ewuana, with a daily capacity of 50,000 ft. J. R. Shaw is president.

The city of Burns, Ore., contemplates the construction of

a municipal lighting plant, estimated to cost $55,000. Louis C. Kelsey, Portland, is consulting engineer.

The Silver Falls Timber Co., Salem, Ore., contemplates the erection of a pulp mill in connection with its lumber plants and to utilize the by-products. It is understood the company is interested in equipment.

The Alladin Co., manufacturer of ready-cut houses, Portland, will add two new units to its plant early in the year. A. A. Patterson is local manager.

The Cremona Phonograph Co., Portland, has taken over the plant of the Albany Furniture Co., Albany, Ore., which it will remodel to manufacture phonographs. The company has increased its capital from $75,000 to $350,000 to expand its business. New equipment will be added and the plant will employ 150. F. W. Cutler is president.

The Olympic Ice & Machine Co., Joseph Falco, president, Tacoma, Wash., plans the immediate construction of a four-story cold storage and ice plant, 100 x 120 ft., to cost $125,000, exclusive of equipment.

The Kwik Cap Co., Portland, has been organized with $50,000 capital by T. H. Eckerson, A. W. Eckerson and Arthur Turnbull. A plant will be established for the manufacture of automobile valve caps and other accessories.

The Vancouver Specialty Mfg. Co., Vancouver, Wash., has been incorporated for $300,000 by Fred Dundee, Vancouver, president. It will manufacture refrigerator and other specialties.

The N. & M. Lumber Co., Centralia, Wash., will enlarge its planing mill and install electrically driven equipment at a cost of about $15,000.

The Harris Mfg. Co., Stockton, Cal., manufacturer of harvesters, has established headquarters at Walla Walla, Wash., and is arranging for the establishment of a plant in that city.

The Norway Pacific Shipbuilding Co., Everett, Wash., has a contract to build six 12,000-ton steel tank steamers for Norwegian interests. Construction is to be completed by 1922.

Canada

TORONTO, Nov. 8.

A plant to cost $500,000 will be constructed at the corner of Hanson Street and Coxwell Avenue, Toronto, to be occupied by the Crouse-Hinds Co. of Canada, Ltd.; the Harvey Hubbell Co. of Canada, Ltd., and the Hubbell-Mack Machine Screw Co., Ltd. The main building will be 80 x 500 ft., three or four stories; foundry, 60 x 300 ft. and a pattern warehouse 100 x 100 ft., two stories. It is expected that the buildings will be erected and machinery installed ready to commence operations by Nov. 1, 1921.

John Coughlan & Sons, Columbia and Front streets, Vancouver, B. C., have been awarded contract for the construction of a drydock to cost $3,500,000 for the Department of Public Works, Dominion Government, Ottawa.

The Compton Co., Providence, R. I., is making arrangements to start work on the erection of a factory at Cowansville, Que., in the spring. H. A. Richmond is secretary.

The Goldie & McCulloch Co., Ltd., Galt, Ont., is in the market for one 60-in. or 72-in. single head vertical boring and turning mill.

The American Axle Co., capitalized at $6,000,000, has secured an interest in the Beaver Truck Co., Hamilton, Ont., and in future will supervise operations there. Under the reorganization H. R. Williams, who organized the Beaver Truck Co., becomes president and general manager; E. W. Macavay, president American Axle Co., vice-president, and Capt. Harry Trenaman, treasurer. The directors include William Mulvaney, E. D. J. Stares, W. H. Dawson, P. C. Wolf and P. J. Schultz. Plans are under way to turn out 5000 trucks during the next year and arrangements are also being made to place a new model on the market.

T. McAvity & Sons, Ltd., St. John, N. B., is in the market for several No. 6 turret screw machines.

The Pulverman Tirometer Co. of Canada, Ltd., Toronto, has been incorporated with a capital stock of $300,000 by Oscar H. King, 67 Yonge Street, Toronto; Philip E. Pulverman, Charleston, W. Va., and others to manufacture valves, tires, automobile accessories, etc.

See & Smith Motors, Ltd., Toronto, has been incorporated with a capital stock of $260,000 by James S. Beatty, 10 Adelaide Street East; John R. Rumball, 65 Charles Street West; Edward H. Brower and others to manufacture automobiles, trucks, accessories, etc.

Fairy Toys, Ltd., Toronto, has been incorporated with a capital stock of $40,000 by Benjamin Luxemberg, 268 Palmerston Avenue; John R. Huffman, 648 Shaw Street; Maxwell Aiken, and others to manufacture toys, metal goods, machinery, etc.

The plant of the Hawboldt Gas Engines, Ltd., Chester, N. S., was recently damaged by fire, with an estimated loss of $30,000.

The Nitro Electric Co., Ltd., Toronto, has been incorporated with a capital stock of $40,000 by Frank Bott, room 407, 156 Yonge Street; Robert D. Hume, room 1007, 157 Yonge Street; Ernest V. McKague and others to manufacture electric fixtures, machinery, motors, etc.

The Hold-Mar Vacuum Piston, Toronto, has been incorporated with a capital stock of $100,000 by Charles H. Yochum, 107 Gilmour Avenue; Ernest M. Brooks, 1237 Lansdowne Avenue; Albert F. Cornelius and others to manufacture vacuum pistons, iron, steel, machinery, tools, etc.

The Gulf States

BIRMINGHAM, Nov. 8.

The Merrill-Stevens Shipbuilding Corporation, Jacksonville, Fla., will remodel the former shipyard of the Terry & Brittain Co., recently acquired. Equipment will be provided for the construction and repair of all kinds of vessels. J. E. Merrill is vice-president and general manager.

The Richmond Type & Electrotype Foundry, Birmingham, Ala., is planning to rebuild its foundry, recently destroyed by fire with loss estimated at about $40,000.

Fire, Oct. 28, destroyed a portion of the No. 1 Plant of the W. M. Cady Lumber Co., McNary, La., with loss, including machinery, estimated at about $150,000.

The Fell-Skip Planter Co., Goliad, Tex., has been incorporated, with a capital of $25,000, by W. M. Neyland, S. H. Passmore and C. R. Rylander, to manufacture farm planters and other agricultural machinery.

The Oscar Daniels Co., Tampa, Fla., is planning to rebuild the forge shop and other mechanical buildings at its shipyard, destroyed by fire recently with loss estimated at about $25,000.

The Keisling Gin Co., Big Springs, Tex., recently organized, has acquired a local building and plans the installation of cotton ginning machinery. L. F. Keisling is head.

The Board of Control, Birmingham, Ala., C. B. Rogers, chairman, is planning for the construction of a machine shop, woodworking department, metal-working shop, etc., at the Alabama Boys' Industrial School, East Lake Station, Birmingham.

The Brazil Fluid Burner Co., Montgomery, Ala., has been incorporated, with a capital of $150,000, by D. H. Brazil, Robert Harris, Jr., and A. F. Whiting, to manufacture oil-burners and oil-burning equipment.

The Safety Swing Co., Birmingham, Ala., has plans under way for the erection of a new plant for the manufacture of swings, hangers, etc. T. L. Cook is president.

The International Shipbuilding Co., Pascagoula, Miss., has acquired about four acres in the vicinity of its yard, and plans the erection of additions. The installation will comprise cranes, machine tools and other equipment.

The City Council, Apalachicola, Fla., has arranged for the erection of a new municipal electric light and power plant, and a bond issue of $50,000 has been approved. Bids for equipment will be asked at an early date. J. H. Cook is mayor.

The St. Louis & San Francisco Railway, St. Louis, has awarded a contract to the F. O. Clark Co., St. Louis, for a new machine shop and locomotive repair works at Dublin, Tex. F. G. Jonah is chief engineer.

The Brinkley Brick & Tile Co., Coleman, Tex., is planning for the installation of new equipment to increase its capacity from 30,000 to 60,000 bricks per day. At a later date it will enlarge the works to include departments for hollow tile and paving brick manufacture.

The Port Commissioners, New Orleans, W. O. Hudson, president, 200 New Orleans Court Building, will install coal and conveying machinery at the municipal docks. H. M. Gallagher, 1 Canal Street, is acting chief engineer.

Government Purchases

WASHINGTON, Nov. 8.

Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, schedule 6976, opening Nov. 23, for 1 swaging machine for Philadelphia; schedule 6979, opening Nov. 12 for electric arc welding equipment for Philadelphia and New Orleans; schedule 6990, opening Nov. 23 for miscellaneous machine tools for Brooklyn; schedule 6994, opening Nov. 26 for 4 deck winches for Brooklyn; schedule 7004, opening Nov. 23, for 1 patternmakers' lathe for Philadelphia, and schedule 7015, opening Nov. 26, for 6 bench planers for Philadelphia.

NEW TRADE PUBLICATIONS

Electric Hoists.—Link Belt Co., 910 South Michigan Avenue, Chicago. Catalog No. 380. Illustrates and describes a line of standardized monorail electric hoists as well as overhead electric traveling cranes in capacities of ½ to 3 tons inclusive. Tables of weights, clearance dimensions and speeds are included.

Foundry Flasks.—American Foundry Equipment Co., 366 Madison Avenue, New York. Describes corrugated steel flasks, flask bars, taper snap flasks, snap mold jackets, cast bottom plates, mounting frames and pattern mounting compound. The catalog is illustrated.

Tool Holders, Ratchet Drills and Drop Forged Wrenches.—Armstrong Bros. Tool Co., 317 North Francisco Avenue, Chicago. Catalog B-20, 43 pages, 4 x 6 in. Lists, illustrates and describes a line of tool holders for turning, boring, threading, knurling, cutting off, planing, slotting and drilling metals; ratchet drills of universal, short, Packer, Weston and standard reversible types; drop forged wrenches and other machine shop specialties.

Wagon Loaders.—George Haiss Mfg. Co., Canal Place, New York. Booklet 820. Describes the Haiss "Path Digging" wagon loaders, which are self-feeding, self-propelling and self-crowding. Views show the wagon loader in operation.

Water Heater.—Griscom-Russell Co., 90 West Street, New York. Bulletin 260. Describes the Reilly feed water heater, made with cast-iron shell. The heating surface consists of Reilly coils of seamless drawn copper tubing.

Thread Miller.—Smalley General Co., Bay City, Mich. Pamphlet. Illustrates and describes the company's No. 1-C thread miller with power traverse. It is designed for especially heavy work such as milling 2 and 3 pitch threads up to 5 or 6 in. long as well as lighter threads and smaller pitches at one revolution of the work.

Automatic Starters for Motors.—General Electric Co., Schenectady, N. Y. Two Bulletins, describing series contactor type automatic starters for series, shunt, or compound-wound direct-current motors. Bulletin 68433 describes a starter for use where automatic starting is desired upon closing a line switch at some remote point. Bulletin 68436 describes an automatic starter operated by a push button, or by the operation of a float switch, pressure governor, or similar accessory.

Ball Bearings.—Fafnir Bearing Co., New Britain, Conn. Booklet No. 20, 70 pages, 5½ x 8½ in., with the title "Fafnir Ball Bearings for Your Machine." Describes types of Fafnir ball bearings and how to mount them. Photographs show actual examples of the application of the ball bearings to various types of machines, electric motors, and high speed grinding spindles.

Gas Producers.—Smith Gas Engineering Co., Dayton, Ohio. Bulletin No. 16. Illustrates and describes the company's type "G" producer, a mechanically operated producer for the generation and delivery of clean cold gas.

Brass Melting.—Acheson Graphite Co., Niagara Falls, N. Y. Booklet. Presents information in regard to electric melting of non-ferrous metals. Various types of electric furnaces are described, and tables showing comparative metal losses when melting non-ferrous metals in the electric furnace and fuel fired furnace, and the average cost of melting brass with fuel fired or electric furnace are included.

Blast Furnaces.—William B. Pollock Co., Youngstown, Ohio. Catalog No. 33. Illustrations of modern blast furnaces which the company has built.

Snagging Wheels.—Norton Co., Worcester, Mass. Booklet with the title "Snagging." Deals with the selection, care and use of snagging wheels.

Economics of Lighting.—Cooper Hewitt Electric Co., Hoboken, N. J. Booklet with title "Studies in the Economics of Lighting," by E. Leavenworth Elliott. A reprint of an article from the *Central Station*.

Goggles.—Strauss & Buegeleisen, 16 Hanover Place, Brooklyn, N. Y. Presents advantages of Resistal goggles. The lenses, it is explained, are non-shatterable.

Belting Manual.—Flexible Steel Lacing Co., 4969 Lexington Street, Chicago. Booklet with the title "Short Cuts to Power Transmission." A handbook for belt users. Chapters cover considerations in belt buying, different kinds of belts, care of belts, making belt joints, making belts endless, belt calculations, causes of belt troubles, etc.

Steel Mill Control.—Cutler-Hammer Mfg. Co., Milwaukee. Bulletin 870, 48 pages, 8½ x 11 in. Discusses some of the problems involved in the control of motor driven steel mill machinery. The story of iron and steel from the ore in the mines to the finished product of the steel mills is outlined and various applications of Cutler-Hammer control apparatus are explained. Electric brakes, lifting magnets, space heaters, Thomas meters for measuring gases and magnetic separator pulleys are also described. Numerous installation views are shown.

Insulating Brick.—Armstrong Cork & Insulation Co., Pittsburgh. Booklet, 72 pages, 6 x 9 in. Deals with the insulation of high temperature industrial equipment, such as furnaces, boiler stills, hot blast stoves, etc. Nonpareil bricks are described and their uses outlined. Results of heat transmission tests, operating records with and without insulation, and other valuable data are included.

Magnesia Pipe and Boiler Covering.—Magnesia Association of America, 721 Bulletin Building, Philadelphia. Booklet of 80 pages, 7¾ x 10¾ in. with title, "Defend Your Steam." A study of the cause and prevention of heat losses and the transmission of steam for power or heating purposes. Information upon heat and heat losses, their cause and prevention, tables and data on coal saving, the correct thickness of pipe and boiler covering, is given. An outline of the properties of magnesia, its characteristics and properties as a pipe and boiler covering, specifications for its application, etc., add to the value of the book as a reference volume. Tables and data are added for the use of engineers and architects in the preparation of specifications for insulations. Illustrations show applications of magnesia coverings in plants of various kinds.

Air Operated Drills.—Denver Rock Drill Mfg. Co., Denver, Col. Booklet with title Waugh 90 Drills. Describes three air-operated drills; a No. 90 drill for coal and iron mining; a No. 93 for drilling in rock and which can be operated either wet or dry; and a No. 95 identical with the No. 93 except that it is designed for dry drilling only. Views of the drills in use are included.

Universal Measuring Machine.—Société Genevoise d'Instruments de Physique, Geneva, represented by the Golden Co., 405 Lexington Avenue, New York. Booklet. A reprint of a description of a universal measuring machine from the *Engineer*, London, England. The machine is designed to measure not only plain gages, but also to deal with the various measurements which have to be made on plug screw gages. Measurements are performed by reference to a standard which is in the form of a divided scale read by a microscope provided with a special micrometer in the eyepiece.

Floor Coverings.—Armstrong Cork & Insulation Co., Pittsburgh. Two booklets. One booklet with the title "Linotile Floors" shows applications of tiles made of powdered cork and furnished in different shapes, sizes and colors for use as a floor covering. The other booklet describes cork tile, made from cork shavings compressed and baked.

Desk File.—Ross-Gould, Tenth and Olive streets, St. Louis. Booklet. Describes a desk system file made up of a series of interlocking metal units or uprights, joined together, thus to provide as many compartments as may be required.

Power Transmission Machinery.—A. & F. Brown Co., 79 Barclay Street, New York. Catalog No. 66, 129 pages, 5 x 8 in. Illustrates and describes a line of power transmission machinery including gears, shafting, couplings, pulleys, countershafts, hangers and floor stands, pillow blocks, sole plates, steam and air driven sirens, etc.

Material Handling Machinery.—Franklin Moore Co., Winsted, Conn. Bulletin 5001. Devoted to the company's electric hoists and traveling cranes. The bulletin is illustrated.

Boring Mills.—Cincinnati Planer Co., Cincinnati. Catalog, 31 pages, 8½ x 11 in. Illustrates and describes rapid production boring mills made in five sizes from 42 to 84 in., and massive mills made in sizes of 8, 10 and 12 ft., and extension type 10 x 16 ft.

Marine Pumps and Auxiliaries.—Worthington Pump & Machinery Corporation, 115 Broadway, New York. Catalog BK-3000, 125 pages, 6 x 9 in. Describes an extensive line of pumping machinery for marine service covering types adapted for the various classes of work met in shipboard practice, including Naval and Merchant Marine requirements. Section 1 covers reciprocating pumps of horizontal, vertical, simplex and duplex types; section 2, air pumps and condensers; section 3, oil pumps; section 4, centrifugal pumps; section 5, miscellaneous and marine auxiliaries. The book is illustrated.

Valuation and Report Service.—Ford, Bacon & Davis, 115 Broadway, New York. Booklet with the title "Strength in Union." Explains the service which the company is prepared to furnish as follows: Technical and commercial investigations and expert testimony; designing and planning; construction; valuation and reports; purchasing, inspection and forwarding; operation and management; financing and developing.

BOOK REVIEWS

The History of Cuba. By Willis Fletcher Johnson. Five Volumes. Pages 6 x 9 in. Published by B. F. Buck & Co., 156 Fifth Avenue, New York.

The fifth volume of this very complete history of Cuba is devoted to resources, important among which are the numerous rich bodies of iron ore and other ores, such as manganese, chromium and nickel. Mining operations back in the early days of the sixteenth century soon after Columbus discovered the island, we are told, centered around the search for gold. The mining of other metals was only incidental then, and continued thus for many years. After the discovery of rich deposits of gold in Mexico, however, interest in operations in Cuba waned considerably.

Not until the early part of the nineteenth century did the presence of enormous deposits of iron ore found throughout the mountain districts of the province of Oriente present themselves to the outside world as a profitable project. Next to gold up to this time the rich deposits of copper ore received chief attention.

Nearly all of the great iron deposits of Oriente lie within a few feet of the surface, and on the southern slopes of the Sierra Maestra it is necessary only to scrape the dirt from the side of the hills, take out the ore and send it down to the sea by gravity. Similar conditions exist at the Mayari mines on the north coast, where the deposits need nothing but washing with cold water. The latter mines are now being worked by Bethlehem Steel interests. Nickel is also contained in most of the iron ores taken and of course enhances its value. Besides the deposits in the province of Oriente large quantities of nickeliferous iron ore are found in the provinces of Camaguey and Pinar del Rio.

The work of the United States Geological Survey, commenced in 1918 to ascertain the quality and quantity of manganese and chrome deposits in Cuba, and undertaken with the idea of discovering means for quickly producing new volumes of these valuable materials for wartime use, and the results thereof are described. The American engineers sent out on the survey expedition discovered many workable deposits of these ores. The province of Oriente alone, it is declared, with the investment of a few hundred thousand dollars in road building, can supply the mills of the United States with all the chromium and manganese ore needed for the development of the steel industries.

Naval Consulting Board of the United States. By Lloyd N. Scott, late captain and liaison officer to the Naval Consulting Board and War Committee of Technical Societies. Pages 288, 9 x 5¾ in., numerous illustrations and diagrams. Published by Superintendent of Public Documents, Government Printing Office, Washington.

The complete details about the organization of the Naval Consulting Board, composed of distinguished engineers and scientists selected from the membership of eleven leading American technical societies and headed by Thomas A. Edison, and much of the work it accomplished (not including, of course, that part which necessarily must still remain secret) are set forth in this volume by Captain Scott. According to Josephus Daniels, Secretary of the Navy, who wrote the preface, it would have been impossible for the Navy to have carried on its part in winning the World War without the contribution of civilian thinkers, foremost among whom, of course, were the members of the Naval Consulting Board.

The story about the campaign for suggestions from the country's inventors and the scheme for handling the flood of suggestions that came in is particularly illuminating and throws light on the bent for inventing things prevalent throughout the nation. All told, 110,000 inventions or ideas for inventions from the public were examined and passed upon. Most of the ideas were turned in by amateurs, however, and out of the great number sent in only 110 were considered of sufficient value to be sent to committees and but one was put into production, although several others were developed and might have been put into use later on.

Inventive accomplishments of members of the Naval Consulting Board receive special treatment in the book and descriptions with illustrations are given of notable inventions by Maxim, Edison, Sperry, Hewitt, Sprague and Hutchinson. One of these by Hudson Maxim had to do with a new method of making gun tubes by utilizing great hydraulic pressure and thus permitting the manufacture of a gun in one piece. Another by Mr. Maxim was an invention for mounting large guns on railroad cars and securing the cars in concrete emplacements. Mention is also made of Mr. Maxim's study of large-caliber-gun erosion.

Considerable space is also devoted to a whole string of inventions by Thomas A. Edison, more important of which are listening devices, means for sharp turning of a ship, application of smoke screen, turbine head for projectiles and reacting shell. Among Elmer A. Sperry's contributions an automatic submarine alarm and an improved anti-aircraft searchlight, both of which are described. A net system and several bomb devices invented by Frank Sprague and a portable searchlamp by Dr. Miller Reese Hutchinson also receive mention.

Accounts in Theory and Practice. By Earl A. Saliers, Ph.D., assistant professor of accounting, Yale University. Pages 300, 6 x 9 in. Published by the McGraw-Hill Book Co., 239 West Thirty-ninth Street, New York.

Although written primarily as a first-semester college textbook, this book should prove quite useful to accountants and business men generally, because of the effective combination of theoretical discussion and practical application. The author has divided the book into six parts, dealing respectively with fundamental principles, partnership, accounting, expansion of accounting records, corporation accounting, financial statements, and special applications of principles. A very convenient bibliography is appended to each of these sections. A special effort is made by Dr. Saliers to drive home in this book the various fundamental principles of accounting. The more complicated aspects of general procedure he is planning to discuss in a later volume.

Fuel Oil in Industry. By Stephen O. Andros. Pages 288, 6 x 9 in.; 107 illustrations and 14 tables. Published by the Shaw Publishing Co., 910 South Michigan Boulevard, Chicago.

This is a practical and concise compendium of information on fuel oil burning in the different industries, as well as the equipment used. Early chapters are devoted to an extensive discussion of the principles of fuel oil combustion and to a presentation of the physical and chemical properties of fuel oil. This is followed by a comparison of coal and fuel oil which gives typical analyses of different coals and the influence of impurities on efficiencies of combustion, comparative efficiencies of powdered coal and fuel oil, and cost figures of a plant operating on fuel oil and one operating on powdered coal. A chapter on colloidal fuel explains compositions and characteristics. Chapters follow on distribution and storage, heating, straining, pumping and regulating.

Applications of fuel oil are presented in six industries in chapters on the arrangement of boiler furnaces, types of fuel oil burners, fuel oil in steam navigation, oil burning locomotives, the manufacture of iron and steel, and heat treating furnaces. Applications of fuel oil in the production of electricity, in the sugar industry, glass industry, ceramic industries, and in heating public buildings, hotels and residences are discussed. The book concludes with a chapter on oil in gas making and an appendix on fuel oil uses.

Causes of Skin Sores and Boils Among Metal Workers is the subject of a 51-page booklet published by E. F. Houghton & Co., Third and Somerset streets, Philadelphia, manufacturers of oils and leathers. This treatise was prepared primarily for executives in the metal-cutting industries to aid them in recognizing and overcoming the causes of the skin infection troubles encountered when certain liquids are used as an aid in metal-cutting and metal-working.

Current Metal Prices

On Small Lots, from Merchants' Stocks, New York City

The quotations given below are for small lots, as sold from stores in New York City by merchants carrying stocks.

As there are many consumers whose requirements are not sufficiently heavy to warrant their placing orders with manufacturers for shipment in carload lots from mills, these prices are given for their convenience.

On a number of articles the base price only is given, it being impossible to name every size.

The wholesale prices at which large lots are sold by manufacturers for direct shipment from mills are given in the market reports appearing in a preceding part of THE IRON AGE under the general heading of "Iron and Steel Markets" and "Metal Markets."

Iron and Soft Steel Bars and Shapes

	Per Lb.
Bars:	
Refined iron, base price	5.50c.
Swedish bars, base price	20.00c.
Soft Steel:	
¾ to 1⅞ in., round and square	3.48c. to 4.75c.
1 to 6 in. x ⅜ to 1 in.	3.48c. to 4.75c.
1 to 6 in. x ¼ to 5/16 in.	3.58c. to 4.75c.
Rods—⅝ and 11/16 in.	3.53c. to 5.45c.
Bands—1½ to 6 by 3/16 to No. 8	4.18c. to 7.00c.
Hoops	5.68c. to 7.00c.
Shapes:	
Beams and channels—3 to 15 in.	3.58c. to 4.30c.
Angles:	
3 in. x ¼ in. and larger	3.58c. to 4.30c.
3 in. x 3/16 in. and ⅛ in.	3.83c. to 5.10c.
1½ to 2½ in. x ⅛ in.	3.63c. to 4.90c.
1½ to 2¾ in. x 3/16 in. and thicker	3.58c. to 4.85c.
1 to 1¼ in. x 3/16 in.	3.63c. to 4.90c.
1 to 1¼ in. x ⅛ in.	3.68c. to 4.95c.
⅞ x ⅞ x ⅛ in.	3.73c. to 5.00c.
¾ x ⅛ in.	3.78c. to 5.05c.
⅝ x ⅛ in.	4.18c. to 5.95c.
½ x 3/32 in.	5.28c. to 7.65c.
Tees:	
1 x ⅛ in.	3.98c. to 5.90c.
1¼ in. x 1¼ x 3/16 in.	3.88c. to 5.80c.
1½ to 2½ x 3/16 in. and thicker	3.68c. to 5.60c.
3 in. and larger	3.63c. to 5.30c.

Merchant Steel

	Per Lb.
Tire, 1½ x ½ in. and larger	4.75c.
(Smooth finish, 1 to 2½ x ¼ in. and larger)	5.35c.
Toe calk, ½ x ⅜ in. and larger	6.00c.
Cold-rolled strip (soft and quarter hard)	12c. to 14c.
Open-hearth spring steel	7.00c. to 10.00c.
Shafting and Screw Stock:	
Rounds	6.25c. to 7.00c.
Squares, flats and hex	6.75c. to 7.50c.
Standard cast steel, base price	15.00c.
Best cast steel	20.00c. to 24.00c.
Extra best cast steel	25.00c. to 30.00c.

Tank Plates—Steel

¼ in. and heavier	3.78c. to 4.50c.

Sheets

Blue Annealed

	Per Lb.
No. 10	7.00c. to 8.00c.
No. 12	7.05c. to 8.05c.
No. 14	7.10c. to 8.10c.
No. 16	7.20c. to 8.20c.

Box Annealed—Black

	Soft Steel C.R., One Pass Per Lb.	Wood's Refined, Per Lb.
Nos. 18 to 20	8.40c. to 9.30c.	.....
Nos. 22 and 24	8.45c. to 9.35c.	10.80c.
No. 26	8.50c. to 9.40c.	10.85c.
No. 28	8.60c. to 9.50c.	11.00c.
No. 30	8.70c. to 9.75c.	.....

No. 28, 36 in. wide, 10c. higher.

Galvanized

	Per Lb.
No. 14	8.85c. to 10.10c.
No. 16	9.10c. to 10.25c.
Nos. 18 and 20	9.25c. to 10.40c.
Nos. 22 and 24	9.40c. to 10.55c.
No. 26	9.55c. to 10.70c.
No. 27	9.70c. to 10.85c.
No. 28	9.85c. to 11.00c.
No. 30	10.35c. to 11.50c.

No. 28, 36 in. wide, 20c. higher.

Pipe

Standard—Steel	Blk.	Galv.	*Wrought Iron*	Blk.	Galv.
½ in. Butt...	—34	—17	¾-1½ in. Butt.	— 3	+17
¾-3 in. Butt.	—38	—22	2 in. Lap.....	+ 3	+21
3½-6 in. Lap.	—33	—18	2½-6 in. Lap..	+ 1	+17
7-12 in. Lap..	—23	— 6	7-12 in. Lap...	+12	+30

Steel Wire

BASE PRICE* ON No. 9 GAGE AND COARSER	Per Lb.
Bright basic	8.00c.
Annealed soft	8.00c.
Galvanized annealed	8.75c.
Coppered basic	8.50c.
Tinned soft Bessemer	10.00c.

*Regular extras for lighter gages.

Brass Sheet, Rod, Tube and Wire

BASE PRICE

High brass sheet	25¼c. to 26c.
High brass wire	26¼c. to 27c.
Brass rod	23¼c. to 25c.
Brass tube	41½c. to 43c.

Copper Sheets

Sheet copper, hot rolled, 24 oz., 26½c. to 27½c. per lb. base.

Cold rolled, 14 oz. and heavier, 2c. per lb. advance over hot rolled.

Tin Plates

Bright Tin		Coke—14x20		
			Primes	Wasters
Grade "AAA" Charcoal 14x20	Grade "A" Charcoal 14x20	80 lb...	$10.80	$10.55
		90 lb...	10.90	10.65
		100 lb...	11.00	10.75
IC...	$16.50	$14.25	IC...	11.25	11.00
IX...	18.75	16.25	IX...	12.25	12.00
IXX...	20.50	18.00	IXX...	13.25	13.00
IXXX...	22.25	19.75	IXXX...	14.25	14.00
IXXXX...	23.75	21.50	IXXXX...	15.25	15.00

Terne Plates

8-lb. Coating 14 x 20

100 lb.	$ 9.35
IC	9.50
IX	10.50
Fire door stock	12.75

Tin

Straits pig	43c.
Bar	50c. to 55c.

Copper

Lake ingot	18c.
Electrolytic	17¾c.
Casting	17½c.

Spelter and Sheet Zinc

Western spelter	8¾c. to 9c.
Sheet zinc, No. 9 base, casks	14c. open 14½c.

Lead and Solder*

American pig lead	8c. to 8¾c.
Bar lead	9c. to 10c.
Solder, ½ and ½ guaranteed	30c.
No. 1 solder	27½c.
Refined solder	23½c.

*Prices of solder indicated by private brand vary according to composition.

Babbitt Metal

Best grade, per lb.	90c.
Commercial grade, per lb.	50c.

Antimony

Asiatic	8½c. to 9½c.

Aluminum

No. 1 aluminum (guaranteed over 99 per cent pure), in ingots for remelting, per lb.	35c. to 38c.

Old Metals

There is a better feeling in the trade and prices are a little stronger, although business is still quiet. Dealers' buying prices are nominally as follows:

	Cents Per Lb.
Copper, heavy and crucible	12.50
Copper, heavy and wire	11.50
Copper, light and bottoms	10.25
Brass, heavy	7.75
Brass, light	5.50
Heavy machine composition	12.25
No. 1 yellow brass turnings	7.00
No. 1 red brass or composition turnings	10.00
Lead, heavy	5.25
Lead, tea	3.75
Zinc	4.00